RAILROAD GAZETTE

FRIDAY, MAY 12, 1893.

CONTENTS.

Contributions.

Delay to Freight in Yards.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The letters printed in your issue of April 7 taking exception to your recent article on the above subject are a pretty good indication of the way in which a freight yard is regarded by American railroad men. Instead of looking at it as an arrangement of tracks to perform certain duties they consider it an evil; a necessary evil, perhaps, but an evil first and foremost.

In the present case the *Equipment Guide* publishes an article calling attention to the delay of freight in yards. The author states that yards often get so blockaded that freight trains are held out on the main track; and he suggests that, in order to avoid this, the yardmaster be empowered to increase his force promptly when he thinks it necessary. Your editorial points out that this will be a costly remedy, and suggests that freight trains would not be often held out on the main track if yards were so planned that when the trains come along there would be proper tracks to receive them. This is, doubtless, a proposition open to argument. Personally I agree with you, although there are a great many railroad men who think otherwise. But when a diagnosis has been made of a disease, and when two cures are suggested, one would expect that such discussion as follows would at least touch upon these remedies.

Not at all. The gentlemen who have written to you on this subject do not so much as mention the two remedies proposed. One of them makes a broad, and, to my mind, a false distinction between yards at terminals and yards at junction points of divisions, and he states that the way to avoid blockades at division points is by making through freight trains which shall not go into these yards at all. The other letter simply states that the larger the yard the more trouble you have with it. The only thing in which the two gentlemen seem to agree is that in their opinion a yard is an evil.

Now this is not the case. A yard is no more an evil than is the rest of the permanent way of a railroad. We cannot couple an engine to every separate car that is loaded and haul it to its destination without reference to the other cars which we have to move; we must shift cars from the loading points and arrange them in trains and, wherever such arrangement of cars has to be done, there we must have a yard. Again, we cannot run our engines indefinitely. They and the cabooses must be cut off at certain points, and wherever an engine and caboose are cut off there we must have a yard. We cannot run trains of the same length over all portions of our railroad and wherever the train load is changed there, again, we must have a yard.

Now a yard, like most other things, if well designed will do good work, and if badly designed will do bad work. In point of fact, almost all the yards in America are badly designed, and probably the great majority of them do bad work; but this should not blind railroad men to the fact that it is possible to design a yard properly, and that it is possible for such a yard to do good work.

Very probably the most important point in any yard is a proper arrangement for the reception of trains and the consequent speedy release of the engines which bring the trains in, and I cannot see but that you at tacked the subject at the vital point in calling attention to this fact; but it seems that you should have begun further back, with an essay to prove that freight yards are necessities and not evils.

If we admit that a yard is an integral part of a normal railroad we then are ready to discuss our subject in a rational way; and I beg to again say that this matter of reception tracks is a vital principle in planning a yard. If you have only half a dozen tracks, arrange at least five of them so that they can be *conveniently* used as reception tracks. If the yard is larger, this requirement may be treated as less rigid, but the root idea is that the trouble always comes at the inward end and therefore the greatest reserve of resources should be made available to be massed, so to speak, at that end.

H. D. W.

Union Pacific Fast Mail Locomotive.

The illustrations given with this show the general design and arrangement of the machinery of a locomotive built in October, 1892, in the Omaha shops of the Union Pacific, to be used in hauling the heavy mail trains over the mountain division of the road between Cheyenne and Laramie, Wy. The grade over much of this division is 90 ft. to the mile, and in some places it is 114 ft. to the mile. The trains often consis of six cars, and the schedule time over the 90-ft. grade requires an average speed of 25 miles per hour. The locomotive shown has hauled a train of four mail cars and two officers' cars over this part of the division in considerably less than schedule time.

Referring to the side elevation, fig. 1, some of the features more clearly shown by it are: The diamond stack and the combination of short smokebox, low exhaust pipe and convey pipe. Several years ago this road adopted the straight stack and extension front as standard, and a large number of the locomotives were equipped with them, but it was found that the cost of repairs to the locomotives was greatly increased, and the actions at law for damages for setting fires became more frequent, and it was decided to return to the old arrangement. The fuel used is lignite coal, obtained along the line of the road in Wyoming, and with a straight stack and extension front the locomotives throw out a continuous stream of fire, as when burning wood. With the diamond stack and short smokebox this is prevented to a great extent. With the extension front, also, it was found that the exhaust nozzle had to be contracted to such an extent to burn the fuel as to cause excessive back pressure. The resulting heavy draught, causing the hot gases to impinge with greater force on the ends of the tubes, was more injurious to the tubes, and the increased temperature in the smokebox made extra precautions necessary to keep the steam joints inside the smokebox tight. Great care was necessary also to prevent leaks in the seams of the extension front, as these would interfere greatly with the draught through the tubes and also ignite the sparks that lodged in front of the tube sheet.

Other Western roads have found that in burning this lignite coal the diamond stack causes less trouble than the straight stack and extension front.

GENERAL DIMENSIONS U. P. FAST MAIL LOCOMOTIVE.

Gauge	4 ft. 8½ in.
Cylinders	19 in. diam. by 24 in. stroke.
Driving wheels, diameter	69 in.
Truck wheel "	30 in.
Wheel base, rigid	8 ft. 10 in.
" " total	23 ft. 8 in.
Total length of frames	31 ft. 7½ in.
Weight on drivers in working order	81,025 lbs.
Weight on truck	38,575 "
Weight, total, in working order	119,600 "
Diameter of piston rod	3¾ in.
Tubes, number	253
" diameter	2 in.
" thickness	No. 11 B. W. G.
" length	11 ft. 6⅛ in.
Heating surface, firebox	176 06 sq. ft
" " tubes	1529.30 " "
" " total	1705.36 " "
Grate surface	22.8 sq. ft.
Steam pressure	180 lbs.
Exhaust nozzle, style	double.
" " height	7 in.
" " diameter	3⅛ "
Convey pipes, diameter	12 "
Stack, diameter	18 "
" height above rail	15 ft. 6⅛ "
Valve travel	5¾ "
Outside lap	1 "
Inside lap	0
Lead in full gear	1/16 in.
Throw of eccentrics	5¼ "
Length of steam ports	17 "
Width of steam ports	1⅛ "
Length of exhaust port	17 "
Width " "	3 "
Bearings, diameter of, driving axle	8 "
" length of, " "	11¼ "
" diam. of, engine truck axle	4¼ "
" length " " "	10 "
Driving axle, diameter	7⅛ "
Engine truck axle, diam., middle	4⅞ "
" truck, type	rigid
Total length of engine and tender	63 ft. 3 in.
Boiler diameter, smallest ring	60 "
Wagon top, height	8¾ "
" top, diameter	5 ft. 10⅞ "
Total length of boiler	23 ft. 4⅝ "
Firebox length	7 ft. 11⅝ "
" width	34⅛ "
Weight of tender loaded	95,400 lbs.
Capacity of tank	4,000 gallons
" of coal space	13 tons
Number of wheels	8
Diameter of wheels	33 in.

Another feature shown on the side elevation is the location of the injector outside of the cab with the steam connection to the top of the wagon top between the cab and dome. The air pump is placed lower than is

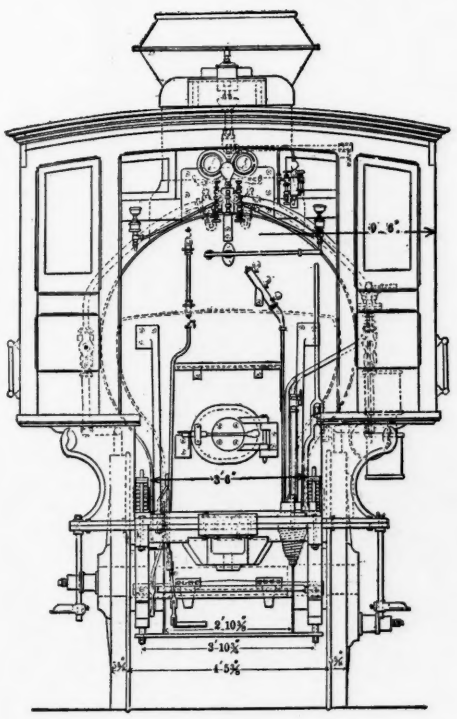


Fig. 5—Back End.

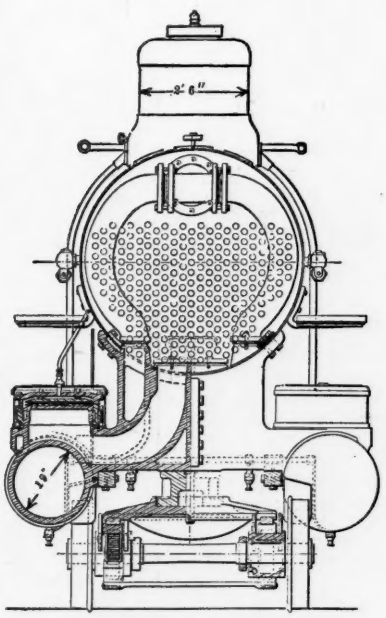


Fig. 6—Half Section through Cylinders.

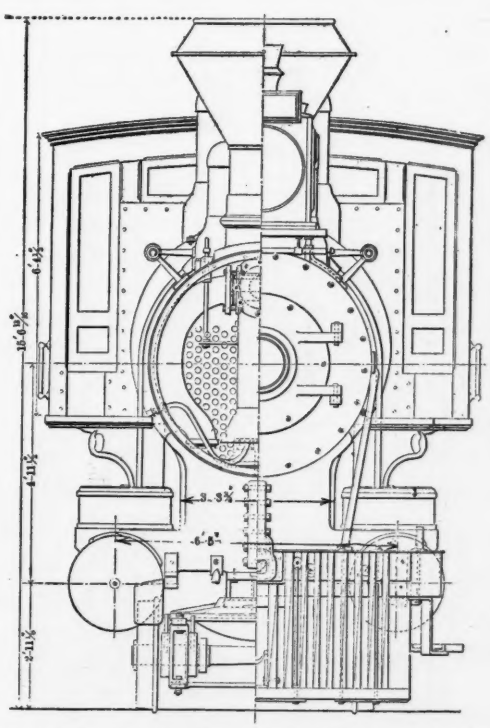


Fig. 7—Half Cross-Section through Smokebox and Half Front View.

UNION PACIFIC FAST MAIL LOCOMOTIVE.

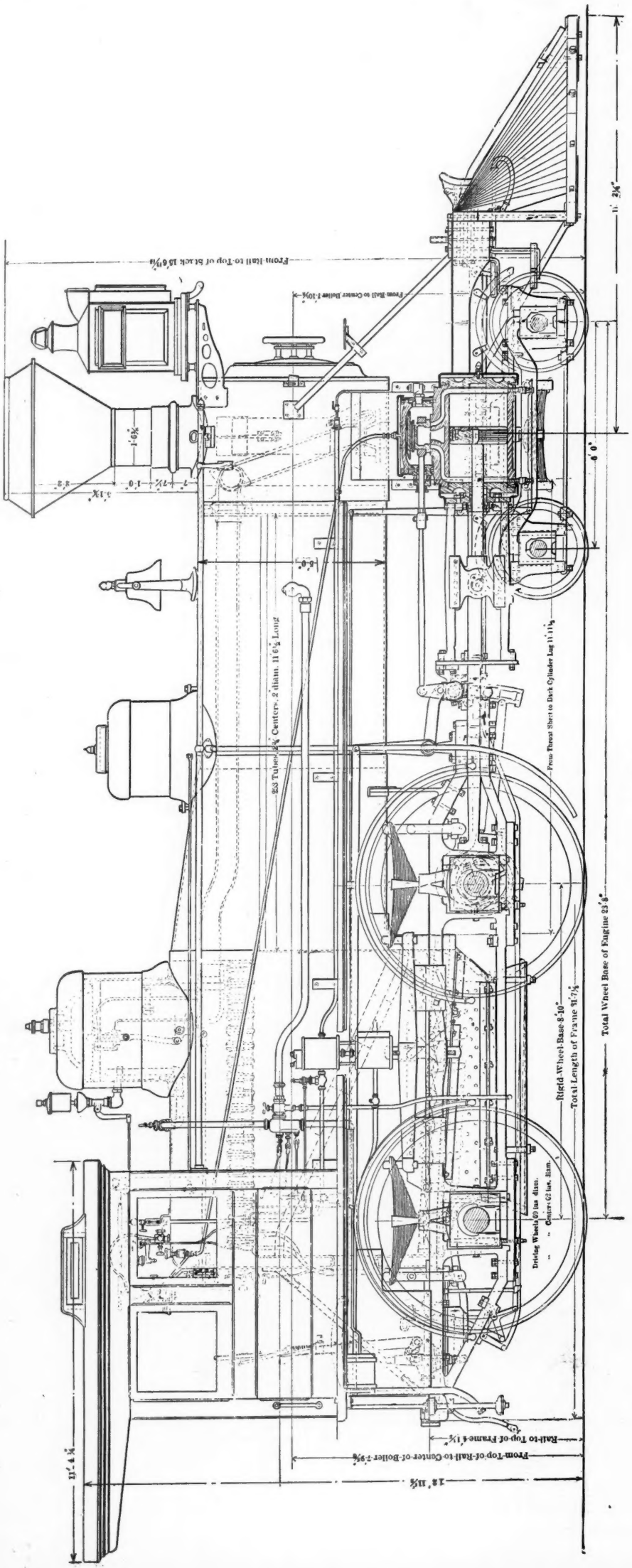


Fig. 1.

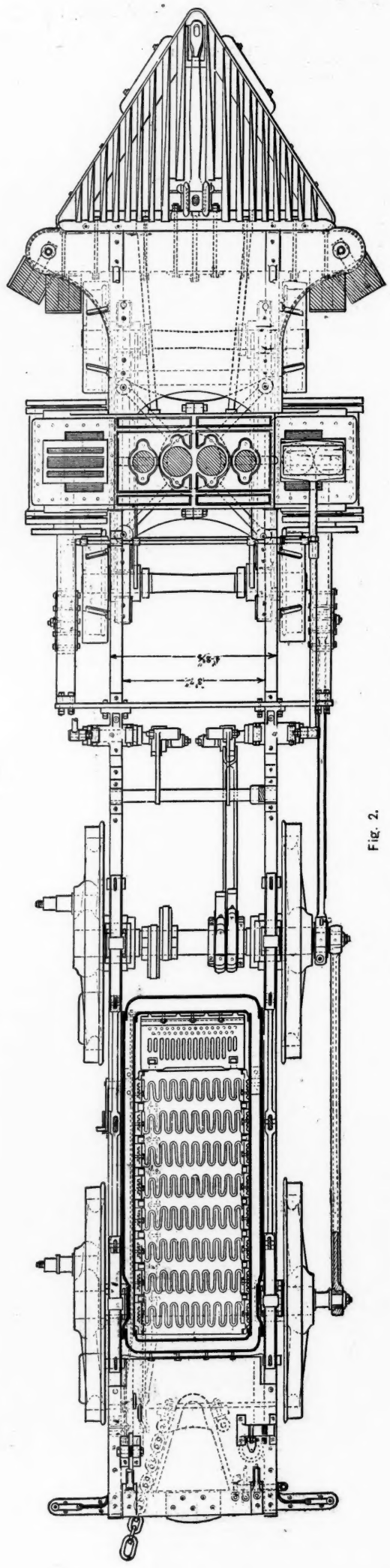


Fig. 2.

UNION PACIFIC LOCOMOTIVE FOR FAST MAIL TRAINS.

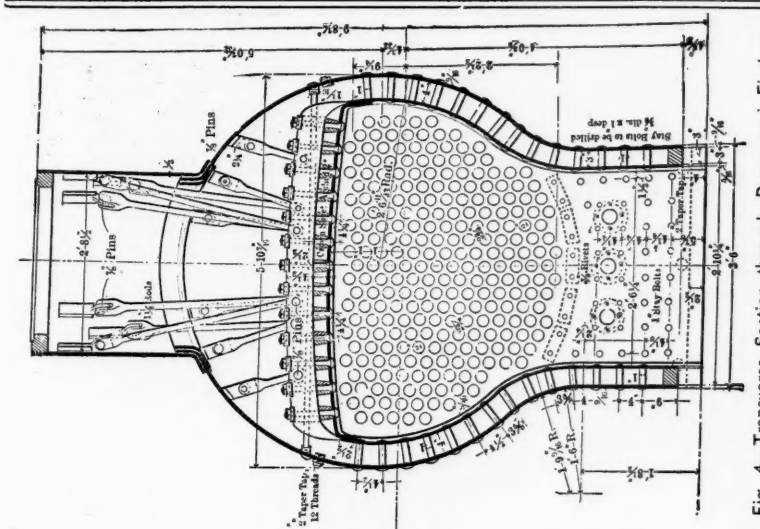


Fig. 4—Transverse Section through Dome and Firebox.

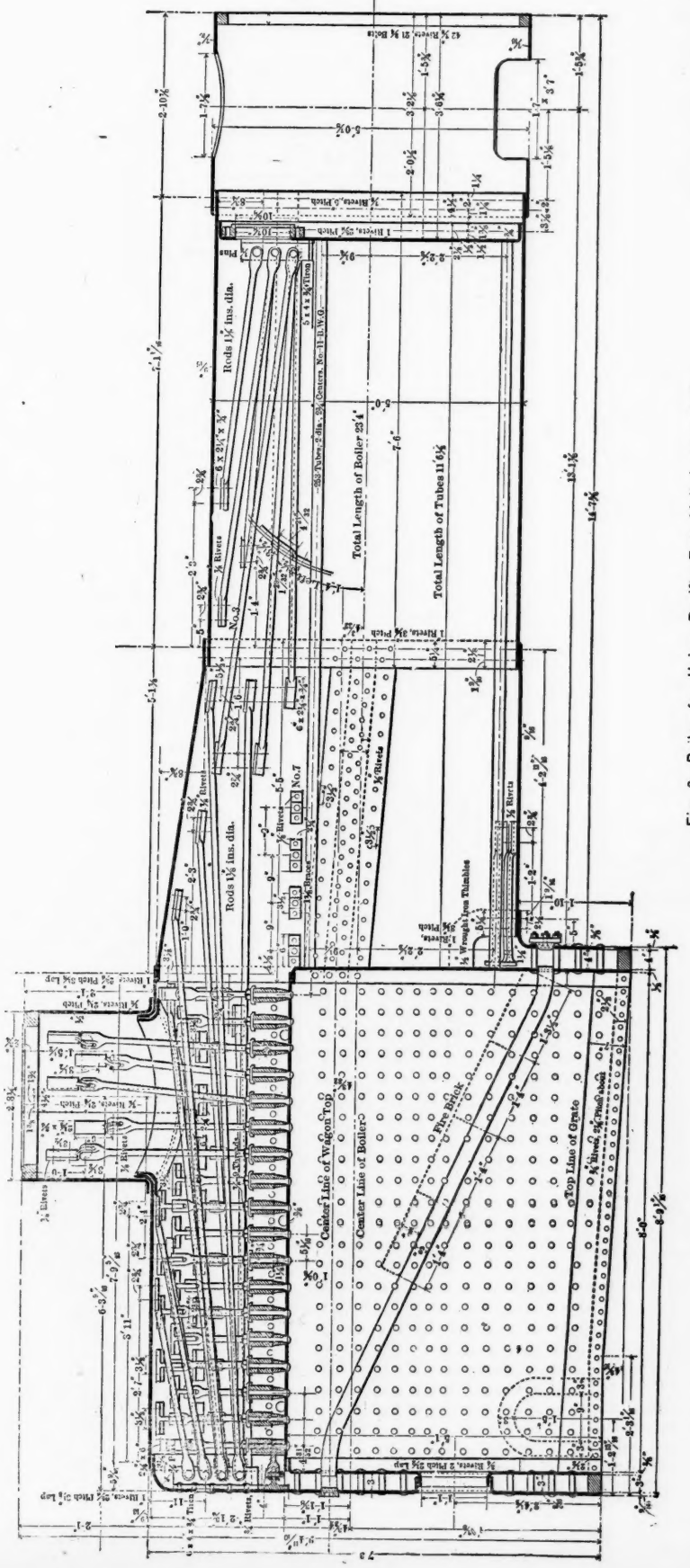


Fig. 3—Boiler for Union Pacific Fast Mail Locomotive.

general, only the steam cylinder being above the running board. The cab is made with a deck sash for convenient ventilation. The cab is so placed that only the back head of the boiler projects inside.

The boiler, figs. 3 and 4, is of the wagon-top type with dome on the wagon top. It is designed to carry 180 lbs. pressure per sq. in., and for this reason is exceptionally well stayed. The staybolts throughout are 1 in. in diameter, spaced about 4 in. by 4 in. Those in the second row from the bottom on each side are 1¼ in. in diameter with a hole through them ⅝ in. in diameter. The crown sheet is supported by crown bars 4½ in. deep and ¾ in. thick, with 1⅛ in. swing stays. The back crown bar bolt also secures a brace extending to the back head. The front tube sheet and back head are reinforced with 1⅛ in. diagonal stays which are secured to a 5 × 4 × ⅝ in. tee iron riveted to the front tube sheet and to a 6 × 4 × ⅝ in. tee iron riveted to the back head. They are secured to the cylindrical part of the boiler by two rivets ⅞ in. in diameter in each brace. There are 253 2-in. tubes 11 ft. 6½ in. long. The first and second rings, wagon top sheet, side sheets, and back head, are of steel, $\frac{9}{16}$ in. thick. The throat sheet is of steel ⅝ in. thick. The tube sheets and dome are also of steel ½ in. thick, and the smokebox is of steel $\frac{7}{16}$ in. thick.

The firebox is 8 ft. long and 34¼ in. wide inside. The side sheets are $\frac{5}{16}$ in. thick, and the crown and back sheets ⅝ in. thick, and all of steel. It has a brick arch supported by three water tubes 3 in. outside diameter. These water tubes extend from the tube sheet, below the tubes, to the upper part of the back firebox sheet, and are expanded into each sheet to make a tight connection. Opposite the lower ends of these tubes there are holes in the throat sheet to permit the cleaning and repair of the tubes. The holes in the throat sheet are covered with plate gaskets making ball joints with the sheet, and held in place by means of four studs. Opposite the upper ends of the tubes are holes in the back sheet, and these are stopped with screwed plugs. The firebox is $4\frac{3}{16}$ in. deeper at the front end than at the back end, sloping from a point 2 ft. 3 in. from the back head to the front end. The distance from the bottom of the firebox ring to the lowest tube is 2 ft. 2 in. Some of the general dimensions are given in the table above.

The Paige steel tired wheel is used under the tender and the Allen steel tired wheel under the engine truck. Two No. 10 Monitor injectors are used to supply water to the boiler.

A comparison of this locomotive with two others built recently for fast passenger service is shown in the following table, which gives a few of the general dimensions of each. The New York Central locomotive was described and illustrated in the *Railroad Gazette*, April 7, 1893, and the Cleveland, Cincinnati, Chicago & St. Louis locomotive in the issue of April 14, 1893.

COMPARISON OF PASSENGER ENGINES.

	N. Y. C. & H. R. Locomotive.	C., C., C. & St. L. Locomotive.	U. P. Locomotive.
Gauge	4 ft. 8½ in.	4 ft. 8½ in.	4 ft. 8½ in.
Cylinders, diameter and stroke	19 × 24 in.	18½ × 24 in.	19 × 24 in.
Driving wheels, diameter	78 in.	68 in.	69 in.
Weight on drivers, working order	81,400 lbs.	86,500 lbs.	81,025 lbs.
Weight on truck, working order	44,750 "	4 ,780 "	38,575 "
Weight, total	126,125 "	129,280 "	119,600 "
Tubes, number	268	241	253
" diameter	2 in.	2 in.	2 in.
" length	12 ft.	11 ft. 4 in.	11 ft. 6½ in.
Heating surface, firebox	147.7 sq. ft.	143.74 sq. ft.	176.06 sq. ft.
" " tubes	1,670.7 "	1,426.28 "	1,529.3 "
" " total	1,818 4 "	1,570.02 "	1,705.36 "
Grate surface	27.3 "	31.3 "	22.8 "
Boiler pressure, lbs.	180	180	180
Stack, style	Straight Plain.	Straight Cast iron. Ornamental.	Diamond.
Valve travel	5½ in.	5⅝ in.	5¾ in.
Steam ports, size	18 × 1¼ in	23 × 1¼ in.	17 × 1⅛ in.
Exhaust ports, size	18 × 2¾ in.	23 × 2½ in.	17 × 3 in.
Driving wheel journals, length	10½ in	10½ in.	11½ in.
" " diameter	8½ in.	8½ in.	8 in.
Boiler, type	Wagon top.	Belpaire.	Wagon top.
" diameter smallest ring	58 in.	59 in.	60 in.
Firebox, length	96⅜ in.	108$\frac{11}{16}$ in.	95$\frac{5}{16}$ in.
" width	40⅝ in.	41⅞ in.	34¼ in.
Tank capacity	3,500 galls.	4,000 galls.	4,000 galls.
Capacity of coal space	6¾ tons.	7 tons.	13 tons.

Files and Steel.

In an editorial on hand and machine cut files, the *Ironmonger* predicts that the hand cutters will disappear in the course of time, and that the change will be greatly to the advantage of the men, as well as to the community at large. The writer says: "Machines do not get lead poisoning, do not strike, turn out far larger quantities than the hand cutter, meet the demand, and, if they are properly attended to, turn out well finished files." As the American machine-made files have proved to be more serviceable than any others, except the Swiss Gorbet and the Stubbs, it seems machines may be properly attended to.

Of steels, the *Ironmonger* says:

"It is alleged in some quarters that Bessemer steel is made use of far too freely instead of crucible-cast steel, with the result that the reputation of the file manufacturers suffers considerably. These allegations are put forward, probably, on behalf of the hand file cutters. There is, we believe, a certain amount of truth in them; but it is a pretty well established fact that any buyer who pays a proper price can procure an article of the best of quality in respect of the steel of which it is made. Cheap files there have been, and cheap files there are. There is a demand for them, and Sheffield would be foolish to allow that demand to be satisfied elsewhere. Further, it must be remembered that there is Bessemer steel *and* Bessemer steel, the best sorts of which are quite equal to most of the commoner grades of crucible steel. It may or may not be known to many of our readers that there are special billets of Bessemer steel produced in large quantities in and near Sheffield, wherein the carbon contents are more accurately defined and more rigorously observed than in much of the crucible-cast steel. It is clear, therefore, that it would be absurd and impracticable to condemn all files made of Bessemer steel, just as it would be unsafe and empirical to accept without question all files made of crucible-cast steel."

Bessemer steel may be so poor that a manufacturer who openly placed tools of that product on the general market would probably meet with difficulty in selling them, but a special steel has for a long time been in use here where a particularly hard service is demanded of it, which is made entirely from carefully selected and properly treated Bessemer. The ingots are tested by analysis and then rolled down into bars, broken and sorted according to grain as carefully as if they were blister steel, before melting in the crucibles, and there seems no reason, either theoretical or practical, why the resulting poured ingot is not as good as if made from steel produced by cementation.

The Multiple Speed Railroad at the World's Fair Grounds.

In the *Railroad Gazette* of Sept. 11, 1891, appeared an illustrated article on the experimental section of the Multiple Speed Railroad that was about to be put in operation at the World's Fair grounds in Chicago. This short section, 900 ft. long, and built in the form of an ellipse, gave such satisfaction to the inventors,

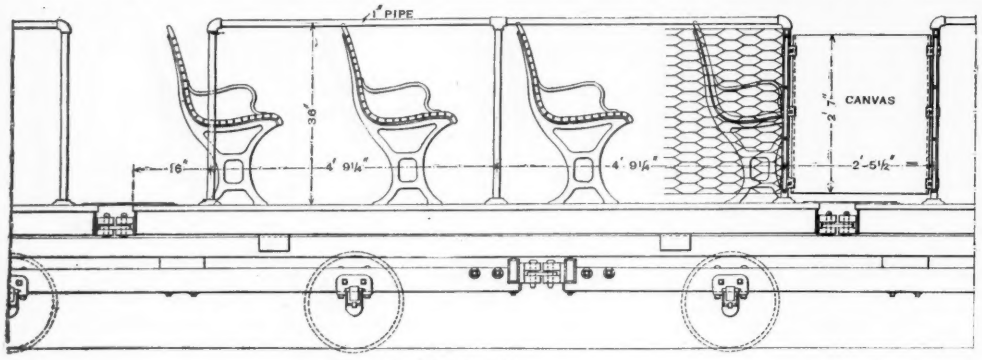


Fig. 2—Side Elevation.

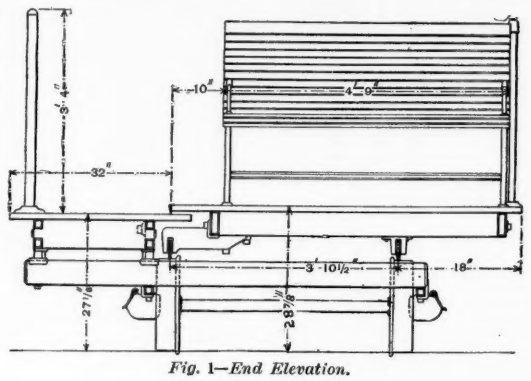


Fig. 1—End Elevation.

Platform and Car—Multiple Speed Railroad.

Messrs. Schmidt & Silsbee, of Chicago, and to the managers of the Fair, that permission was obtained to put in a line on the pier to run between the Casino and the restaurant at the outer end of the pier.

As will be remembered, the device consists of an endless train of four wheel trucks which carry two endless platforms, one of which it carried on the journals in the ordinary way, and runs continuously at a speed of 2½ to 3 miles an hour; the other, being carried on top of the wheels, runs at just twice the speed. The general arrangement of these will be understood from the end view of the platforms and truck, which we reproduce in fig. 1. At the speeds at which these platforms run, a person may readily step from the station platform to the one running at the slower speed, and from that to the one running faster, on which seats are provided.

Electrical plans and mechanical details for the power for the experimental section were arranged by Mr. George K. Wheeler, Engineer of the Railroad Department of the General Electric Company at the Chicago office, and the power arrangement of the line on the pier is installed under his supervision. As at present designed there are 351 cars or trucks all coupled together, and of these 10 are motor cars, three views of which are shown in the accompanying illustrations, figs. 3, 4 and 5. Each of these 10 cars is equipped with two 15-H. P. General Electric railroad motors. As the platform or sidewalk is arranged, it is level with the stationary walk and raised five feet above the pier level, allowing the trolley wires to be placed beneath the surface of the platform, and the current is taken therefrom by means of small trolleys attached beneath the car floor.

The operation of this train of cars is arranged in a novel manner, doing away with motor men, the entire train being controlled and operated from the power station, making it unnecessary to have an attending motor man upon each car. The power station is equipped with an automatic circuit breaker, connected to the supply wires that carry the current to the trolley wire and rails of the sidewalk. This circuit breaker is also connected by means of a separate auxiliary wire to about 20 small switches, which will be so placed as to be easily accessible, and the attendants who will have supervision of train of cars can instantly cut off the current in case of accident, thus putting the entire train under perfect control.

Quite a decided improvement has been made in this installation over the first sidewalk which was built. As has been explained, the top platforms are operated by means of a flexible steel rail passed over the top of wheels of the lower trucks. Thus it will be seen that a continuous circuit is formed, which makes contact with each pair of wheels along the track, and makes it unnecessary to bond the track with copper wire as is the standard practice of all electric railroad systems to-day. The original installation was provided with an auxiliary controlling station where the regulating mechanism was installed. This is abandoned, and all of the mechanism is placed at the power plant in connection with the generator which furnishes the power.

The generator to operate the sidewalk is of the General Electric Company's manufacture, of 200 K-W., multipolar, having capacity of 267 H. P. It is provided with the necessary regulating devices usually furnished with power generators, consisting of main switch, rheostat, ampèremeter, voltmeter, potential indicator, etc.

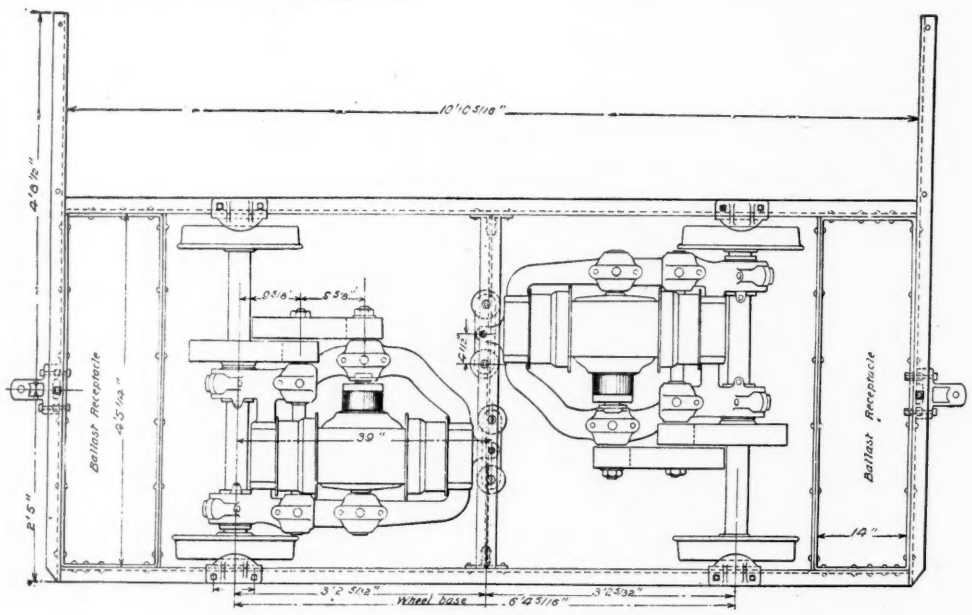


Fig. 3—Plan.

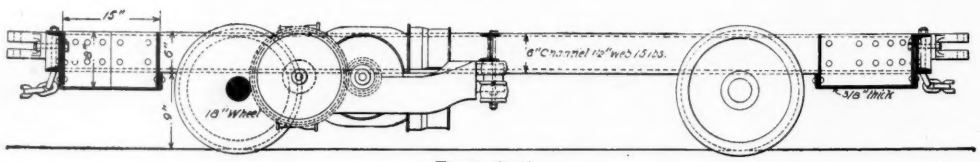


Fig. 4—Section.

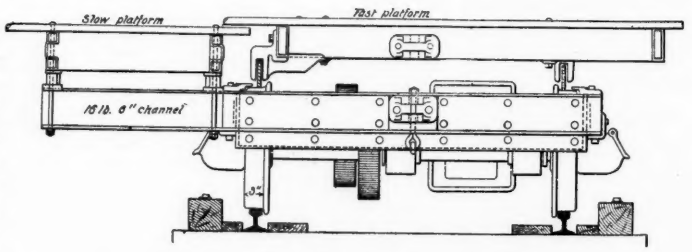


Fig. 5—End Elevation.

Iron Motor Car—Multiple Speed Railroad.

Starting the World's Fair Machinery.

The electric key with which the machinery of the World's Fair was set in motion by President Cleveland was of the Victor pattern, manufactured by The E. S. Greeley Company, of New York, and made of solid gold and ivory. The device for opening the throttle of the Allis-Corliss engine was made by the Electro Automatic Appliance Company, and was encased in an oak box surmounted by a silver gong, the ringing of which served as a signal for the starting of other engines. A sprocket wheel about 8 in. in diameter mounted on the stem of the throttle valve was connected with one of smaller diameter on a small arbor of the electric apparatus which was placed about 2 ft. away. In closing the throttle, a spring inside the box was wound up and automatically locked until the closing of an electric circuit which released the spring, and opened the throttle.

In the Nash & Eddy instrument used for starting the 15,000,000 gallon Worthington pump, the passage of a current of electricity actuated a small valve through which steam was admitted to a cylinder in such a manner as to force open the throttle valve, which is itself a part of the instrument. As no starter of sufficient size to give this pump a full supply of steam was available, the one used was connected as a by-pass valve and the main throttle closed. The closing of the electric circuit by President Cleveland opened the by-pass valve and supplied enough steam to start the pump, after which the main throttle valve was opened. It is expected that the two starters will remain in position during the Fair. The key will be on exhibition in The E. S. Greeley Company's exhibit in charge of Mr. Louis J. Auerbacher.

Official Report of New York Central Brake Tests at Karner, N. Y.

In the *Railroad Gazette* of Feb. 24 was given a synopsis of the results of the brake tests made last September by Mr. P. H. Dudley on the New York Central & Hudson River road, at Karners, near West Albany. The brakes tested were the Westinghouse and the New York. The official report bears out the conclusions given before and gives practically the same results as were given in the synopsis. What follows is the principal part of the official report; the portion omitted pertains mainly to descriptions of the mechanism and minor features.

Standing Test No. 1.—Train line charged with 70 lbs. of air. All brakes cut out. Pump shut off. Record of pressure to be taken at the end of five minutes.

Results.—Both train pipes lost one pound pressure in five minutes and were therefore practically tight.

Standing Test No. 2.—Train line recharged to 70 lbs. Service application to see time required for reduction of train line pressure from first to fiftieth car.

Results.—The first car requires from six to eight seconds to reduce about 6 lbs., the fiftieth car only reducing a pound or a little more in the same time, then until the twenty-fifth or twenty-sixth second while the train pipe on the first car reduces 15 to 16 lbs., the fiftieth car, though also reducing, remains from 15 to 16 seconds a very constant head between it and the first car. For these 50-car trains, 1,940 ft. long in the standing tests, the head was 5¼ lbs. On shorter or longer trains the head and time would vary. The constant head was not observed until all the tables were compared, the diagrams were then re-examined and the time of the constant found to be practically the same in each train. The wave of air in the release from the higher reservoir pressure travels from the first to the fiftieth car in 6 to 10 secs.; some diagrams only show from 3 to 4 secs. If the cylinder pressure varies in any of the cars, those with the lowest will release the quickest.

Standing Test No. 3.—All brakes cut in. Time of reduction in pressure of train line from first to fiftieth car. Service application and release.

NOTE.—Service application to be 20 lbs. reduction in trainpipe.

Results.—Time of application of the pressure of the train pipe from the first to the fiftieth car, service application and release. In the tests of both trains, one to three seconds more time was required before a reduction was effected in the fiftieth car in test No. 2. This discrepancy was due to the pressure being higher in the first car, a flow of air still going to the fiftieth car, and the increase of train pipe, from cock to triple, to be reduced. The constant head was not as quickly reached and was of shorter duration. The constant head between the first and fiftieth car suggests an important field of inquiry in the practical use of the brakes.

TEST NO. 3, NEW YORK.

Pressure in Pounds; Time Intervals in Seconds.

Seconds..	0	11	21½	36½	48¼ Released.	55½	65
1st car.....	70.35	61 95	57.75	52.50	52.30	63.00	....
50th car...	68.25	68.25	63.00	57.75	54.60	....	55.10
Difference	2.10	7.30	5 75	5.25	2.10	....	....

In the New York train, car No. 46,315 did not fully apply, all released.

TEST NO. 3, WESTINGHOUSE.

Pressure in Pounds ; Time Intervals in Seconds.

Seconds.....	0	9	19	29	39	49	59 Released.	69	79	89	99
1st car.....	70.35	63.00	58.80	54.60	52.50	51.45	50.40	63.00	61.40	60.90	60.90
50th car.....	69.30	69 30	64.05	59.85	55.65	53.55	52.50	54.60	57.75	57.75	58.80
Difference.....	1.05	6.30	6.25	5.25	3.15	2.10	2.10	8.40	3.65	3.25	2.10

Standing Test No. 4.—Same as No. 3, except emergency application.

NOTE.—Handle of engineer's valve in emergency notch one second—for emergency application.

Results.—The decrease of time in tests No. 4 is due to the fact that the quick reduction of pressure in the train pipe causes the triple of the first car to start the second one, and so on, the air going from the trainpipe into the cylinders and effecting each succeeding triple very much quicker than would be possible by escape of the air at the engineer's valve; in short, the air only travels one car length instead of a train length, the time being reduced more than one half in the emergency application in comparison with the service application; the air in the train pipe being thus utilized also to increase the pressure in the cylinder.

NEW YORK.

Train line in first car 70.4 lbs., fiftieth car 69.8 lbs.

In 0.16 second from movement of engineer's valve the pressure commenced to fall in the first car, and in 1.8 seconds it was down to 37.8 lbs.

In 3.31 seconds the pressure commenced to fall in the fiftieth car and in 0.17 of a second, or 3.32 seconds from the first car, was down to 48 3 lbs.; first car fell to 37.8 lbs., then rose to 47.3 lbs. in 3.63 seconds.

The release was not ordered until 38 seconds after the application, first car reading 47.3 lbs., and in six seconds first car read 62 lbs., in 88 seconds from release train pipe pressure read in first and fiftieth cars 63 lbs.

WESTINGHOUSE.

Train pipe pressure in first car 69.3 lbs., and fiftieth car 68.3 lbs.; in 0.15 of a second after movement of engineer's valve the pressure began to fall in the first car and in 1.81 seconds was down to 38.85 lbs. In 2.17 seconds, the pressure commenced to fall in the fiftieth car, and in 2.86 seconds, or 2.71 seconds from the first car, was down to 51.45 lbs. The brakes were released in 18 seconds, the fiftieth car releasing in 4.3 seconds later.

Standing Test No. 5.—Time of development of pressure in cylinders from first to fiftieth car. Service application and release.

Results.—In all tests where the comparisons are from the cylinders, the "blowing," leaking of the indicators which is unadvoidable, reduces the pressure in the cylinders more or less rapidly. This feature must not be charged against either brake. The other information gained by the use of the indicators is so valuable that this trouble can be overlooked until special air indicators can be made for such work. Only the diagram of the New York train is presented, the one for the Westinghouse being so similar.

NEW YORK.

In .8 of a second from the movement of engineer's valve, pressure commenced in first car.

Pressure in Pounds; Time Intervals in Seconds.

Seconds.....	6.8	9	13	20	30	40	50	60	Released.
1st car.....	4.7	..	16.8	24.2	34.6	37.8	41.5	42	75 sec.
50th car.....	0.0	3.1	5.65	18.9	28.4	34.7	37.8	34.7	81 "

WESTINGHOUSE.

In .7 of a second after the movement of engineer's valve, the pressure commenced in first car.

Pressure in Pounds, Time Intervals in Seconds.

Seconds	6.8	10	20	30	40	50	60	Release occupied
1st car.	6.3	11.6	24.2	36.3	38.8	37.5	33.6	7 sec.
50th car	3.2	4.2	11.6	22	28.3	31.5	28.4	6½ sec.

Standing Test No. 6.—Same as No. 5. Emergency application and release. Repeated three times.

Results.—There is no question in the standing tests for either train but what the engineer in trying to open his valve in the emergency notch, one second as directed, was more deliberate than he would be in making an emergency application when running; five to six hundredths of a second is the possible time from the locomotive to the first car. The automatic trip indicates 0.04 to 0.05 of a second.

The diagrams* and tabulations of tests No. 6 show at a glance the distinctive character between the action of the two triples in the emergency application, each being constructed upon a different theory regarding the best application of air for such uses. The New York applies rapidly up to 40 lbs., then more slowly, equalizing at a higher pressure of 1 or 2 lbs. than is usual. Three seconds is about the time consumed per car in attaining the maximum pressure.

The Westinghouse applies rapidly, reaching in about one second the maximum pressure per car, which for the same train pipe pressure is 1 to 2 lbs. lower than the New York. The slower application of the New York does not permit of reaching a maximum pressure of 55 lbs. in three and a half seconds on the fiftieth car, as is the case with the Westinghouse.

NEW YORK—(Three Trials).

No. of Trial.	Train pipe pressure. Car 1st.	Car 50th.	Time of 1st mov. of engineer's valve to 1st car. Seconds.	1st car. Time and max. pressure. Seconds.	1st car. Time and max. pressure. Lbs.	50th car. Time of application and maximum pressure. Seconds.	50th car. Time of application and maximum pressure. Lbs.
1st	69.3	69.3	0.25	3.6	58.80	3.38 6.20	55.65
2nd	....	....	0.24	3.2	59.85	3.30 6.20	57.75
3rd	....	....	0.28	3 2	61.95	3.30 6.20	58.25

*Not given with this. See *Railroad Gazette*, Feb. 24.

WESTINGHOUSE—(Three Trials).

No of trial.	Train pipe pressure. Car 1st.	Car 50th	Time of 1st mov. of engineer's valve to 1st car. Seconds.	1st car. Time and max. pressure. Seconds.	1st car. Time and max. pressure. Lbs.	50th Car. Time of application and maximum pressure. Seconds.	50th Car. Time of application and maximum pressure. Lbs.
1st	....	..	0.30	1.30	57.75	2.9 3.8	55.65
2nd	68.3	68.3	0.20	1.20	58.75	2.8 3.7	55.65
3rd	. ..	....	0.20	1.20	57.75	2.75 3.65	55.65

In the three trials of No. 6 test with the Westinghouse train car No. 46,374 leaked off.

Standing Test No. 7.—Time of development of pressure in cylinders, the fifth, sixth and seventh cars cut out. Emergency application and release. Repeated three times.

NEW YORK.

Results.—First trial: First car applied in .2 seconds; fiftieth car applied in 3.7 seconds. First car reached a pressure of 60.9 lbs. in 3 seconds; fiftieth car reached a pressure of 57.8 lbs. in 6.5 seconds. First car released at 58.8 lbs. and the fiftieth car released in seven and a quarter seconds after the first.

Second trial, failed. Train pipe 69.30 lbs. in the first car. Train pipe 70.35 lbs. in the fiftieth car. Third trial, failed. Fourth trial, failed. Train-line pressure 69.30 first car. Train-line pressure, 66.15 fiftieth car.

Fifth trial. Engineer's valve open two seconds. Train pipe pressure 69.30 first car. Train pipe pressure 66.15 fiftieth car. The first car developed a pressure of 60.90 lbs. in 2.7 seconds, and the fiftieth car applied in 4.2 seconds from the movement of the engineer's valve, and reached a pressure of 57.75 lbs. in seven seconds.

WESTINGHOUSE.

First trial. Train pipe, 68.30 lbs., first car; train pipe, 67.20 lbs., fiftieth car. In 0.2 seconds after movement of engineer's valve, first car applied and in 1.1 seconds reached a maximum pressure of 57.80 lbs. The fiftieth car commenced to apply in 2.6 seconds and reached a maximum pressure of 55.65 lbs. in 3.6 seconds. Brakes all on, and all released.

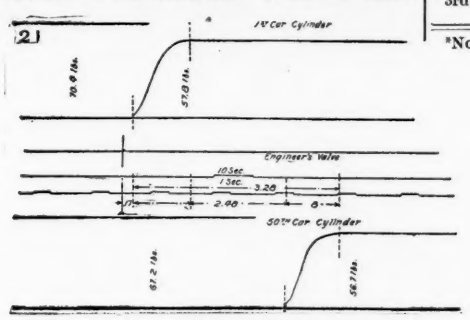
Second trial. Train pipe, 68.25 lbs., first car. Train pipe, 67.20 lbs., fiftieth car. In 0.2 seconds from movement of engineer's valve, first car commenced to apply, and in 1.1 seconds reached a maximum pressure of 57.75 lbs. Fiftieth car commenced to apply in 2.7 seconds and reached a maximum pressure of 55.65 lbs. in 3.6 seconds.

Third trial. A duplicate of trial No. 2, except that fiftieth car was 3.65 seconds in reaching 55.65 lbs.

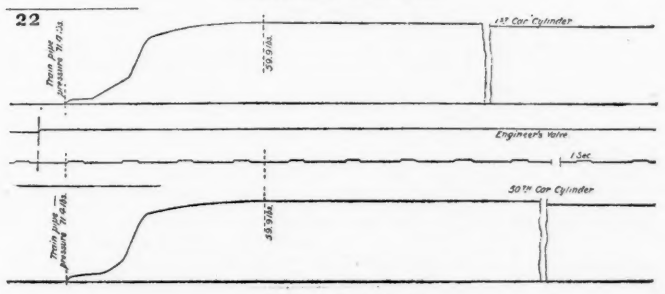
Standing Test No. 8.—(Special and optional.) Same as No. 7, except the fifth to the tenth car inclusive cut out. The New York Brake Co. did not choose to make this trial.

Results.—In practical operations it is often quite as important to know what cannot be done as it is to know what can be done. The Westinghouse Co. made the trial. The handle of the engineer's valve was held in the emergency notch one second, as usual. In four trials the emergency action beyond the cut-out cars did not take place, then the forward rush of air with its stored energy would release the brakes. For such trials the handle of the engineer's valve should be held open much longer in the emergency notch than one or two seconds. To avoid shocks in the train it would be well to distribute cut-out cars—faulty brakes—in lots of two or three in the train, and not confine them to one section. The emergency action would jump two cars at several points in the train.

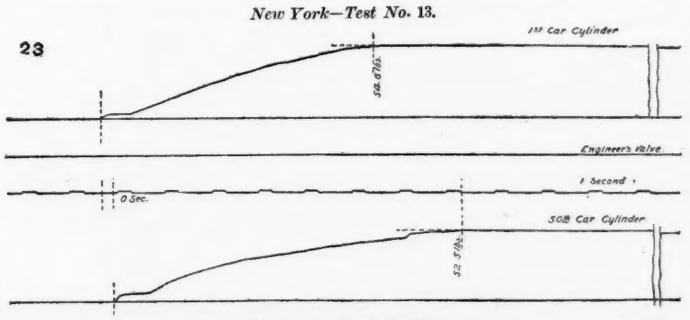
Standing Test No. 9. *Graduation Tests.*—A reduction of 8 lbs. in train-line pressure will be made; then at one-minute intervals further reductions of 4 to 6 lbs. to be



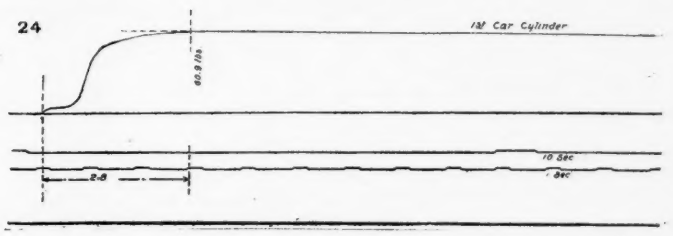
Westinghouse—Test No. 11.



New York—Test No. 13.



New York—Test No. 13.



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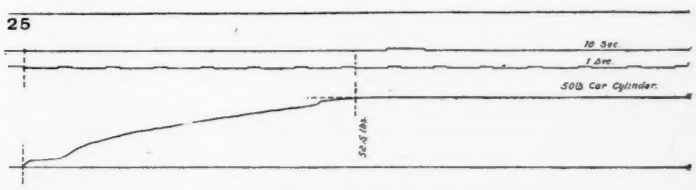
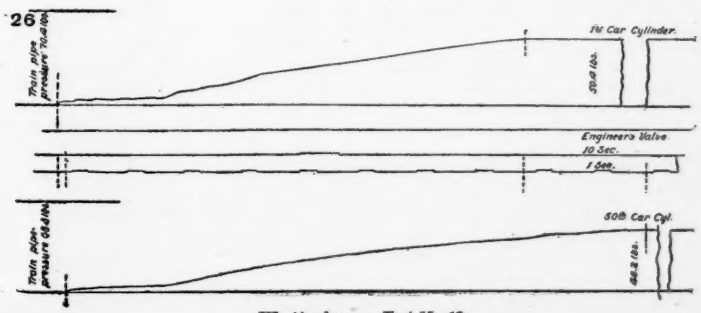


New York—Test No. 13.



Westinghouse—Test No. 13.

Diagrams with Mr. Dudley's Report on the West Albany Brake Trials.

made until reservoirs and cylinders are equalized. Repeated twice.

NEW YORK.

Results.—Test No. 9. First trial: Train-pipe pressure reduced 8 lbs. Pressure in train pipe, first car, 69 30 lbs. Pressure in train pipe, fiftieth car, 67.20 lbs. First car applied in 0.9 of a second after movement of engineer's valve, and the fiftieth car in nine seconds. In 20 seconds the pressure in first car, 23.1 lbs., fiftieth car, 15 75 lbs. In one minute, pressure in first car, 18.90 lbs., fiftieth car, 10.50 lbs. Second application. One minute, train pipe pressure 57.75 lbs. In ten seconds, pressure in first car, 40.95 lbs., fiftieth car, 21.00 lbs. In one minute, pressure in first car, 34.65 lbs., fiftieth car, 13.65 lbs. It will be noticed from the diagrams that the effect of the second application is felt in the fiftieth car in four or five seconds, about one-half of the time of the first application. This seems to be the rule with both brakes. Several applications were made at minute intervals, the seventh not affecting the cylinders in either car. Eleven cars are reported as not applying beyond the leakage groove. The second trial of test No. 9 was similar to the first, until the third application, which applied the brakes in full, as the fourth and fifth applications did not increase the pressure in either the first or fiftieth cars. Six cars are reported as not applying beyond the leakage groove.

WESTINGHOUSE.

Train pipe pressure, first car, 68.25 lbs.; fiftieth car, 67.20 lbs. In 0.5 of a second brakes applied in first car, and in 6.7 in the fiftieth car. In 10 seconds, first car, 8 40 lbs., and in the fiftieth car, 4.20 lbs. At the minute, first car, 8.40 lbs.; fiftieth car, 7.35 lbs. Ten seconds after the second application, first car, 26.25 lbs.; fiftieth car, 15.75 lbs. Five applications were made in this test.

Test No. 9. Second trial. In 0.6 of a second brakes applied in first car, and in 6.9 seconds on the fiftieth car. This trial was similar to the others, except that seven applications were made. All brakes applied in both trials. The diagrams show many interesting features of each triple. The rapid reductions of pressure, especially in the fiftieth car, are due to the blowing of the indicator, which increased as the escaping air lowered its temperature. All brakes applied in both tests.

Standing Test No. 10. *Service Application.*—Fifteen pounds to be admitted into cylinders, pressure noted then at the fifth, tenth and fifteenth minutes.

NEW YORK.

Results.—The first car applied in 0.7 of a second and the fiftieth car in nine seconds. At 50 seconds, first car, 52.50 lbs.; fiftieth car, 38.85 lbs. At five minutes, first car, 57.25 lbs.; fiftieth car, 5.25 lbs. At ten minutes, first car, 40.95 lbs.; fiftieth car, 2.10 lbs. At 15 minutes, first car, 37.80 lbs.; fiftieth car, 2.10 lbs. After the first five minutes, six cars were off. After ten minutes, two more were off; all the others remained on 15 minutes.

WESTINGHOUSE.

Train pipe pressure, first car, 68.25 lbs.; fiftieth car, 67.20 lbs. Brakes applied in first car in 0.9 seconds and in the fiftieth car in six and a half seconds. In 40 seconds pressure was in first car, 31.50 lbs.; fiftieth car, 26.25 lbs. In five minutes pressure in first car, 5.25 lbs.; fiftieth car, 4.20 lbs. At ten and 15 minutes the readings were down to zero in both cars. The readings were affected by the indicators and their connections. All of the cars applied. No. 46,374 was off at the end of five minutes, and 46,399 in eleven minnutes, and 46,337 in twelve minutes; all others remained on fifteen minutes.

Standing Test No. 11.—Same as No. 10, except *all the air* to be exhausted from train-line by emergency application.

NEW YORK.

Results—All brakes applied and none leaked off fully at the end of fifteen minutes.

WESTINGHOUSE.

Mr. Wm. Buchanan, Superintendent Motive Power and Rolling Stock, requested that the time be extended in this test to thirty minutes, which was done, the New York train being subsequently tested the same length of time on another track. All brakes applied and remained on the thirty minutes, except No. 46,374, which leaked off.

NEW YORK.

Test No. 11, with one-half hour limit. The train was not placed upon the tracks used for all other standing tests, but put on another siding of sufficient length to hold the entire fifty cars. The train was charged by engine No. 602 and the train pipe exhausted by an emergency application. The brakes all applied. Three cars were off in 7 minutes and 1 in 9½ minutes, 2 in 12 minutes, 1 in 13 minutes, 1 in 14 minutes, 1 in 15 minutes, 1 in 16 minutes, 1 in 18 minutes, 11 in all. In 20 minutes, Mr. A. P. Massey, Mechanical Engineer of the New York Air Brake Co., thinking the brakes were releasing normally, sent to the engineer and found 16 lbs. pressure in the train pipe, which he considered was releasing some of the brakes and really vitiated the experiment.

Making the time limit of this test 30 minutes instead of 15 adds greatly to its value, and while there should be no question as to the air in the train pipe when the engineer's valve is "on lap" it would be far better after exhausting train pipe to cut out the engine. Any air then found in train pipe would come from leakages of the reservoirs through the triples, one of the important points to be ascertained.

Standing Test No. 12. *Release Test.*—Seventy pounds in train line all the air will be discharged by an emergency application. A pressure of 90 lbs. will then be maintained against a diaphragm ⅛ in. thick, perforated with $\frac{3}{32}$ in. hole, and a record taken of all brakes which release in 30 minutes.

NEW YORK.

Results.—Pressure 22 lbs. in five minutes. One car released in 2 minutes; 3 in 3 minutes; 4 in 4 minutes; 3 in 5 minutes—or 10 for 5 minutes or under. At 10 minutes the pressure was 40 lbs. Six cars released in 6 minutes; 10 in 8 minutes; 7 in 10 minutes. At 15 minutes the pressure in train pipe was 47 lbs. Eleven cars released in 14 minutes. At the end of 30 minutes, 1 car did not release.

WESTINGHOUSE.

Train line pressure at the end of 5 minutes, 10.50 lbs.; 10 minutes, 38.85 lbs.; 15 minutes, 53.55 lbs.; 20 minutes, 59.85 lbs.; 30 minutes, 70.36 lbs. One car released in 5 minutes; 2 in 6 minutes; 6 in 10 minutes; 7 in 11 minutes; 9 in 12 minutes; 10 in 15 minutes; 12 in 18 minutes; 3 did not release at the end of 30 minutes.

Standing Test No. 13.—Test to determine the sensitiveness of the emergency valve. The first and fiftieth cars will be cut from train and hose connected, 70 lbs. pressure will then be maintained and discharged into the train pipe through a diaphragm perforated with a $\frac{5}{32}$-in. hole. Each car to be tested singly, if desired.

NEW YORK.

(Diagrams Nos. 22, 23, 24 and 25.)

Results.—Train pipe, 71.40 lbs. First trial, emergency action occurred in both cars; second trial, emergency action did not occur; third trial, emergency action did not occur; fourth trial, first car only, emergency action occurred; fifth trial, emergency action occurred; sixth, seventh and eighth trials, with the fiftieth car, emergency action did not occur.

WESTINGHOUSE.

(Diagram No. 26.)

Test No. 13, train pipe, 72.45 lbs. First and fiftieth cars, emergency action did not occur. Second trial, emergency action did not occur. Third trial, emergency action did not occur. Fourth trial, first car only emergency action occurred. Fifth and sixth trials, fiftieth car only emergency action did not occur.

Standing Test No. 14.—Test to determine time of charging one auxiliary reservoir. Cars arranged as in test No. 13; cut out brakes; bleed reservoirs. Secure 90 lbs. pressure in main air reservoir and train line. Shut off pump. Note time of charging reservoir to 70 lbs.

NEW YORK.

Results.—First car charged in 72 seconds. Fiftieth car charged in 80 seconds.

WESTINGHOUSE.

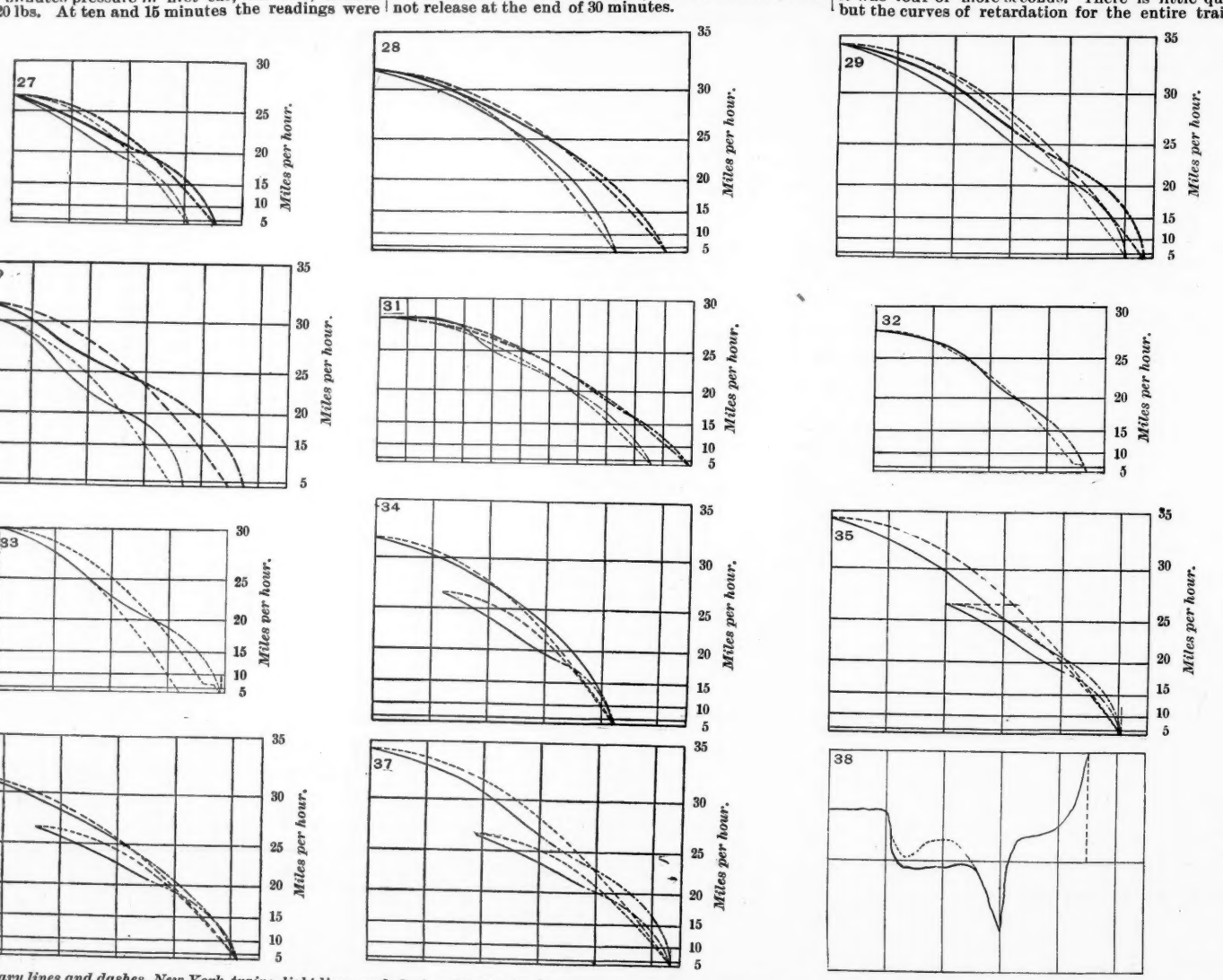
First car charged in 70 seconds. Fiftieth car charged in 80 seconds.

Second Trial.—First car charged in 69 seconds. Fiftieth car charged in 87 seconds.

The standing tests indicate that 70 lbs. of air pressure, in three months' service, will develop leaks in the gaskets or sand holes in the castings which escaped attention when new. Neither brake can be expected to be faultless in this respect, though less leaks from the above mentioned causes were found upon the Westinghouse train than upon the New York train.

ENERGY DIAGRAMS.

From the observed speeds of the locomotive I have for each train and trial plotted curves of their retardation by full lines for the observed spaces, then to the point of the stop by a broken line, the latter being only a general approximation. I have also added an aproximate curve of broken lines or dashes to represent for the centre of gravity of the train its total energy and rate of destruction. There should also be added a third curve to represent the energy of the rear unbraked cars; for as they continue their speed they not only compress the drawbar springs, but push the front of the train and locomotive beyond the point where they would have stopped had their rate of retardation remained unchanged. This is shown in all the energy diagrams. In the slower trials it was about three seconds before the locomotive was affected, while in the higher speeds it was four or more seconds. There is little question but the curves of retardation for the entire train will



Heavy lines and dashes, New York train; light lines and dashes, Westinghouse train. Full lines are plotted from observed speeds. Weight of unmixed trains, 1,593,000 lbs.; weight of mixed trains, diagram No. 32, 1,458,000 lbs.; weight of mixed train, diagram No. 33, 1,738,000 lbs.

No. 38 is a diagram illustrating the changes in tension and compression on drawbar of the locomotives in stopping the trains, after shutting off steam and applying the air. When the changes were large in magnitudes, shocks occurred. The curves above centre line show tension and below centre line comparison.

ENERGY DIAGRAMS, WITH MR. DUDLEY'S REPORT OF THE WEST ALBANY BRAKE TRIALS.

have some minor waves, especially near the top; but until we have the speed at several points of the train they can hardly be determined. If our trains were inelastic, then the speed of the locomotive or any car would be the same as for the entire train. The curve near the stop can in no case exceed the adhesion of the wheels to the rails.

STOP NO. 1.

	Westinghouse train.		New York train.	
	Miles per hour.	Time, sec.	Miles per hour.	Time, sec.
Initial speed	26.78	2.24	26.78	2.24
1st 88 ft	25.32	2.37	25 86	2.32
2d 88 ft	21.12	2.84	22.69	2.64
3d 88 ft	...	.....	.....	....
4th 88 ft	.....	.....	.....	....
Length of stop	270 ft.		310 ft.	
Time of stop	10.6 sec.		.....	
Slideometer 1st car	.25 in.	.25 in.	1.75 in.	
Slideometer 50th car	4 in.		26.50 in.	

STOP NO. 2.

	Westinghouse train.		New York train.	
	Miles per hour.	Time, sec.	Miles per hour.	Time, sec.
Initial speed	32.00	1.875	32.00	1.875
1st 88 ft	31.17	1.925	31.58	1.900
2d 88 ft	29.54	2.037	29 70	2.020
3d 88 ft	.....	2.17	27.06	2.217
4th 88 ft	19.44	4.00	.....	...
176 ft				
Length of stop	373 ft.		450 ft.	
Time of stop	11.50 seconds.		.....	
Slideometer 1st car	.25 in.	.75 in.	.5 in.	.75 in.
Slideometer 50th car	.50 in.		31.00 in.	

STOP NO. 3.

	Westinghouse train.		New York train.	
	Miles per hour.	Time, sec.	Miles per hour.	Time, sec.
Initial speed	34.48	1.74	34.48	1.74
1st 88 ft	33.74	1.778	33.99	1.762
2d 88 ft	31.43	1.906	32.26	1.860
3d 88 ft	27.77	2.160	28.82	2.079
4th 88th ft	22.89	2.622	.....	.....
Length of stop	472 ft., parted 34.8, bt. 5th and 6th cars broken knuckles.		496 ft., parted 38.3, bt. 12th and 13th cars broken knuckles.	
Time of stop	.....		.....	
Slideometer 1st car	.5 in.		.5 in.	.1 in.
Slideometer 50th car	.5 in.		28.25 in.	

STOP NO. 4.

	Westinghouse train.		New York train.	
	Miles per hour.	Time, sec.	Miles per hour.	Time, sec.
Initial speed	30.30	1.980	31.88	1.882
1st 88 ft	30.00	2.00	31.39	1.911
2d 88 ft	25.72	2.333	28 29	2.121
3d 88 ft	20.41	2.939	25.07	2.393
4th 88 ft	.....	.....	.....	.....
Length of stop	325 ft., part'd about one car length.		417 ft., part'd about one car length.	
Time of stop	11 seconds.		.....	
Slideometer 1st car	00		⅞ in.	
Slideometer 50th car	6 ins.		26.5 in.	

In the energy diagrams showing the curves of both trains, in trial No. 1, diagram No. 27, the speed of the locomotives was retarded in the first 88 ft. and, had the same rate continued, would have stopped many feet short of the actual stop. In the second 88 ft. the locomotives are being pushed forward by the energy of the rear cars; while in the next 88 ft. the locomotives are again being retarded by the train. The general changes in tension and compression on the drawbar of the locomotives at Karner are illustrated by a special diagram, No. 38, herewith attached. Trial No. 2, diagram No. 28, at 32 miles per hour with over 59,000,000 ft.-lbs. of energy to destroy, is one of the most important diagrams of the series. The vast amount of energy was not only quickly destroyed, but without the slightest injury to the trains.

The speed of the locomotive for the Westinghouse train was obtained to within a few feet of the stop and shows closely its curve of retardation: first, the rapid retardation; second, the checking of its rate; third, rapid retardation. The obtained speed of the locomotive of the New York train is one space short of the Westinghouse train, yet its curve of retardation is closely shown.

STOP NO. 5.

Service stop by air passing through a diaphragm perforated with a 9.3 2 hole.

	Westinghouse train.		New York train.	
	Miles per hour.	Time, sec.	Miles per hour.	Time, sec.
Initial speed	28 39	2.113	28.39	2.113
1st 88 ft	28.39	2.113	28.39	2.113
2d 88 ft	28.39	2.113	28.39	2.113
3d 88 ft	28.18	2.131	27.94	2.147
4th 88 ft	26.47	2.267	.....	.....
Length of stop	844 ft.		957.5 ft.	
Time of stop	.....		.....	
Slideometer 1st car	00		⅜ in.	
Slideometer 50th car	3 in.		1.25 in.	

STOPS NOS. 6 AND 7.*

	Test No. 6. Mixed 45 cars.		Test No. 7. Mixed 55 cars.	
	Miles per hour.	Time, sec.	Miles per hour.	Time, sec.
Initial speed	27.75	2 162	30.00	2.00
1st 88 ft	27.44	2.186	29.27	2.05
2d 88 ft	25.62	2.342	25.63	2.341
3d 88 ft	19.84	3.024	20.83	2.881
4th 88 ft	.....	.....	.....	....
Length of stop	325 ft., parted in two places about 45 ft.		344 ft., parted in three places.	
Time of stop	10.3 seconds.		.....	
Slideometer 1st car	00		¼ and ¾ in.	
Slideometer 50th car	10.25 in.		23.5 in.	
	Charged.	Applied.	Charged.	Applied.
Air press. 1st car Train pipe.	65	00	72	22.5
1st car Reservoir.	64	53	72	58
1st car Cylinder	00	53	00	54
50th car Train pipe	63	30	70	25
50th car Reservoir.	64	52	70	55
50th car Cylinder	00	50	00	55

*Train of trial No. 6. composed of 25 cars Westinghouse brakes and 20 cars New York brakes, mixed. Train of trial No. 7, composed of 30 cars New York brakes and 25 cars Westinghouse brakes, mixed.

Trial No. 3, diagram No. 29, a speed of 34.48 miles per hour shows a total energy of 68 598.814 ft.-lbs. for each train, capable of doing work equivalent to raising the entire train over 40 ft. above the track. Any one will understand that if a train was allowed to fall 40 ft. the locomotive and every car would be a wreck. The same amount of energy has been destroyed by the brakes in a harmless way in about one-fourth of the train's length, a broken knuckle on each train being the only thing to indicate that any great amount of work had been done. The speed for the distance run was a greater tax upon the locomotives than in the preceding trials, the steam and air pressure falling slightly. Both trains parted just before the stop, an allowance being made in plotting each curve as shown on the diagrams. After this trial locomotive No. 586 was assigned to the New York train and No. 602 to the Westinghouse train.

Trial No. 4, diagram No. 30, was ordered for a speed of 40 miles per hour; the engineers as quick as the stop was made were to release and see which could back up their train first.

Forty miles per hour for the empty trains would require 95,000,000 ft.-lbs. of work, practically the same amount as for the same train at 25 miles per hour, each car loaded to its full capacity, 60,000 lbs. It would have been a very severe tax upon the locomotives, although the engineers were confident it could have been made but for an accident to one of the cam driver brakes on engine No. 586, causing it to drag and limit the speed. Engine No. 602 passed No. 586, and in attempting to slow down to her speed fell below, and the engines passed by each other three or four times in trying to equalize their speeds. The distance, however, was too short to do so and have the entire length of the train all in uniform motion, so the initial speeds given by the locomotives did not give the speeds of the train as closely as in the other trials. Both trains parted, and, some one instantly closing the train pipe cocks on the front of the trains, the engineers released at once and backed up against the rear portion before the partings could be measured. Both trains had to be repaired before they could be coupled, the New York train getting away first. The curves of retardation of the locomotives are very sinuous, due in some measure to the difficulties under which they were run.

Trial No. 5, diagram No. 31, was in the nature of a service stop, the air being discharged through a diaphragm perforated with a $\frac{9}{32}$ in. hole placed in the tripping device pipe for each locomotive. The air was applied faster than through the engineer's valve, however, the train was not sensibly affected until the third space was reached; a 46,506,420 ft.-lbs. of energy to be destroyed and required thirty-two seconds and the long distances run in which to do it. The curves of retardation are similar to those of 50-car trains, each car loaded to its full capacity, the air being applied in the emergency notch. A service stop for the same speed of a loaded 50-car train would be nearly three times as long.

Trial No. 6, diagram No. 32, engine No. 602 on track No. 4. The cars of the distinct trains were switched and made up into mixed trains. Forty-five cars were distributed as follows: 5 Westinghouse, then 10 New York, then 10 Westinghouse, then 10 New York and 10 Westinghouse in the rear. The speed was 27.75 miles per hour; 40,539,744 ft.-lbs. of energy to be destroyed. The curve of retardation of the locomotive is sinuous, the train parting in two places.

Trial No. 7, diagram No. 33, engine No. 586 on track No. 3. Fifty-five cars were distributed as follows: 5 New York, then 5 Westinghouse, then 5 New York, then 10 Westinghouse, then 10 New York, then 10 Westinghouse, then 10 New York on the rear of the train. The speed was ordered for 30 miles and run exactly, having 56,480,436 ft.-lbs. of energy to be destroyed. From the curve of retardation of the locomotive one would expect the train to break apart, as it did. Shocks occurred to both of these trains. The energy diagram curves for the same and different trials show, irrespective of the kind of brakes, the value and importance of time in the application, and are most instructive in this respect.

Comparing No. 1 trial with No. 2 and No. 3 of the Westinghouse train, by plotting each back from the stopping points, we see from No. 1 and No. 2 (diagram No. 34) that No. 1, with a speed of 26.78 miles per hour, commenced to apply the air and stopped in 270 ft., less than one-sixth of the train length; the energy destroyed being 41,381,280 ft.-lbs. The train in No. 2, trial for the same distance still to run, had a speed of 30.5 miles per hour, the air having been applied about two seconds and destroyed over 52,000,000 ft.-lbs. of energy.

Comparing No. 2 for the same speed as No. 1, the air being on about four and a quarter seconds, No. 2 destroyed as much energy in the last 174 ft. as No. 1 did in 270 ft. The comparison between Nos. 1 and 3 (diagram No. 35) is still more striking; when No. 3 had the same distance to run as No. 1, there was 59,000,060 ft. lbs. of energy still to be destroyed, and in the last 166 ft. No. 3 destroyed as much energy as No. 1 did in 270 ft.

The increase of the coefficient of friction as the speed decreases helps to more rapidly destroy the energy, it is true, but it is largely due to the more complete application of the air per car and train. From this we see the importance of applying the air as quickly as possible per cylinder and train.

A comparison of trials Nos. 1, 2 and 3 of the New York train (diagrams Nos. 36 and 37) shows the same general results, except that the distances run were longer to destroy a similar amount of energy.

SHOCKS.

As shown by the energy diagrams, some shocks are likely to be experienced in destroying the vast amount of energy in moving trains, and further the magnitude of the shocks as shown by the tabulations is affected by the time required for the brakes to become effective from the first to the fiftieth car. The shocks of greatest magnitude do not occur when the brakes are first applied, nor at the final stop, but, for the trains tested, between four and six seconds after the air was applied in the emergency stops. Although not measured, yet it was longer in the service stop, as shown by the diagrams.

Although incidental to these trials, I give the time of application of air from the first to the fiftieth car, and the occurrence of shocks on the fiftieth car on the Westinghouse train, as observed by Mr. R. A. Parke, with special electrical apparatus:

Trial No. 1, interval after application 1st car to application 50th car, 2.45 seconds.

Trial No. 1, interval after application 1st car to shock 50th car, 5.70 seconds.

Trial No. 2, interval after application 1st car to application 50th car, 2.68 seconds.

Trial No. 2, interval after application 1st car to shock 50th car, 5 73 seconds.

Trial No. 4, interval after application 1st car to application 50th car, 2.41 seconds.

Trial No. 4, interval after application 1st car to 50th car, 4.94 seconds.

Note.—Trial No. 3 was lost.

No instruments were prepared to measure the time of the shocks in the New York train, but the observer for the fiftieth car, said it occurred about as soon as they could get braced for it after feeling the brakes apply. While, of course, this is not a strict measure of time by one or two seconds, it is sufficiently close to refer the shocks in the rear cars to the same causes in both trains, viz., the sudden checking of the speed of the rear unbraked cars as they run up against the front braked ones. It is a well known fact, as shown by the Burlington tests, that when the air is applied instantaneously to all of the cars of the entire train no shocks are produced.

These trials show that, within the practical limits of applying air to the train, the shocks may be rendered so small as to be of no moment.

The shocks, possibly surges, on the front cars of either train were small. Undoubtedly these follow some law upon the front as well as the rear cars, but in these trials they were too light to be readily assigned to their proper causes. All of the data as to the time, amount and extent of shocks should be autographically recorded, for in tracing their causes it is quite as important to know when as that they did occur.

DATA FROM DIAGRAMS WITH MR. DUDLEY'S REPORT OF AIR BRAKE TESTS.

Diagram No.	Type of brake.	Number of test.	Train, uniform or mixed.	Initial speed, in miles an hour.	Stored energy in train, foot-pounds.	Distance run W. train before stopplug, feet.	Do N. Y. train, feet.	*
27..	N. Y. & W.	1	U.	26.78	41,381,280	270	310	
28..	"	2	"	32	59,085,720	373	450	
29..	"	3	"	34.48	68,598 814	444	470	
30..	"	4	"	W. = 30	52,974,540	307	394	
				N. Y. = 31.88	58,642,920			
31..	"	5	"	2 .39	46,506,420	844	957.	
32	"	6	Mixed	27.75	40,539,744	325	325	
33..	"	7	"	30.0	56,430,436	344	344	
34..	W.	1 & 2	U.	32.0	59,085 720	373	.....	
				26.78	41.381,280	270	.....	
35..	"	1 & 3	"	34.48	68,598,814	444	.....	
				26.78	41,381,280	270	.....	
36..	N. Y.	1 & 2	"	32.0	59.085,720	....	450	
				26.78	41,381,280	....	310	
37..	"	1 & 3	"	34.48	68,598,814	....	470	
				26 78	41,381,280	....	310	

*Remarks.

Broadway Cable Railroad.

The machinery running the downtown section of the Broadway cable was started last Wednesday night, and the cable will now be kept running continuously, but regular cars will not be put on before June 15. The uptown section of the cable is running and cars are in service on the upper end of that part of the line. The uptown cable is 21,152 ft. long and the downtown cable 18,941. Both these are driven from the plant at Houston street. There is another power house further up town.

Reynolds' Automatic Crossing Gate.

The automatic highway crossing gate illustrated in the accompanying cuts has been in use through the winter at the Brinckerhoff street crossing of the West Shore Railroad in Utica, N. Y. The makers report that the test of this apparatus has been thoroughly successful, and that it never failed to work properly during the unusually severe weather of last winter.

The gate is raised and lowered by weights and levers, the weights being lifted by a lever operated by the wheels of passing trains, and electricity being used to control the application of power. A power-house, which is located about 10 ft. from the track, contains the operating weight and four small electromagnets. These instruments are thus completely protected from the weather.

The gates are lowered in the following manner: The engine of an approaching train depresses a suitable track lever located at any required distance from the crossing, and thereby closes an electric circuit which rings a gong at the crossing and actuates an electromagnetic switch. When this switch completes its connection, a falling weight, acting upon a combination of levers, releases a cylindrical case which falls four inches; this permits the weight that operates the gates to drop, and the gates descend. The operating weight is regulated by an air valve, so that its fall is slow, and it can be controlled to any speed desired.

The operating weight is connected with the gates by means of steel rods in iron pipes, which may be erected overhead or placed underground, as desired. The rod actuates a rack and pinion, by which the vertical motion of the weight is converted into the rotary motion necessary to lower the gate.

When the engine of a passing train reaches the crossing it depresses a lever, and turns a steel shaft laid adjacent to the rails, which causes levers located under the cylindrical case, mentioned above, to raise the case, compressing a coil spring within it, which furnishes the power to raise the operating weight to its original position. The weight, however, does not rise until the last car of the train passes the crossing (and the track lever).

The electric battery located in the power-house has a force of 15 volts. A train passing the crossing affects the batteries only two seconds.

While the gate is completely automatic, it can also be worked as a hand gate without any disturbance of the apparatus. If a train has passed the crossing and raised the gates, and it is desired for any reason to lower them, it can be done by bearing slightly with the foot on a treadle on the gate post, which will release the controlling weight, and the gates then gradually fall. They can be raised by hand by moving a lever which will be noticed in the side elevation of the power-house. The illustrations do not need any further description. Fig. 1 shows the gates lowered to protect the crossing, the iron pipes being erected overhead. When the gate bars are up they rest within the hoods, shown in an inclined position, and are thus protected against sleet or rain. Figs. 2 and 3 are sectional elevations of the power-house. Fig. 4 shows the bell crank arrangement by which the horizontal rod actuates the vertical rod in the iron pipe. Fig. 5 shows a vertical section and plan of the gate column, arranged for overhead piping. Fig. 6 is a side elevation showing underground system.

The gate is the invention of George A. Reynolds, of Utica, N.Y., and any further information as to the operation of the gates, the cost of erecting them, or other particulars will be furnished by the Reynolds Railway Gate Company, of Utica.

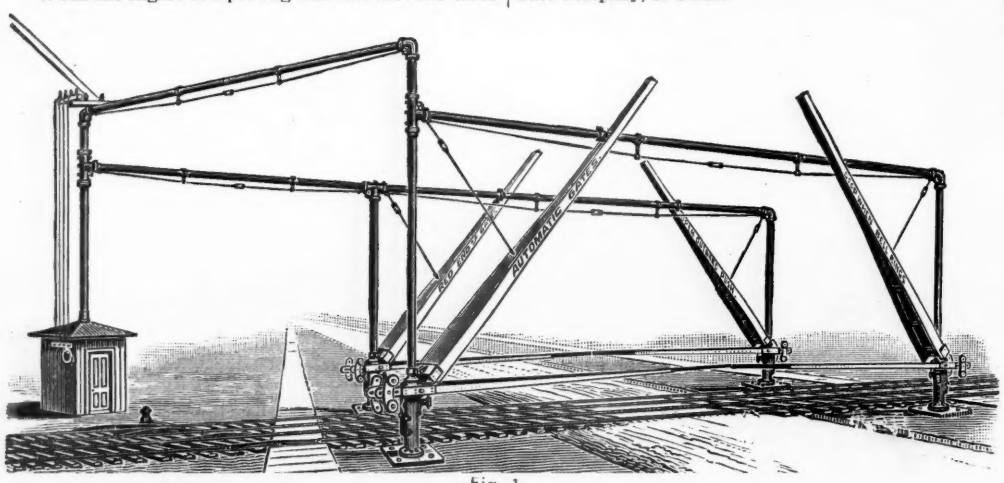


Fig. 1.

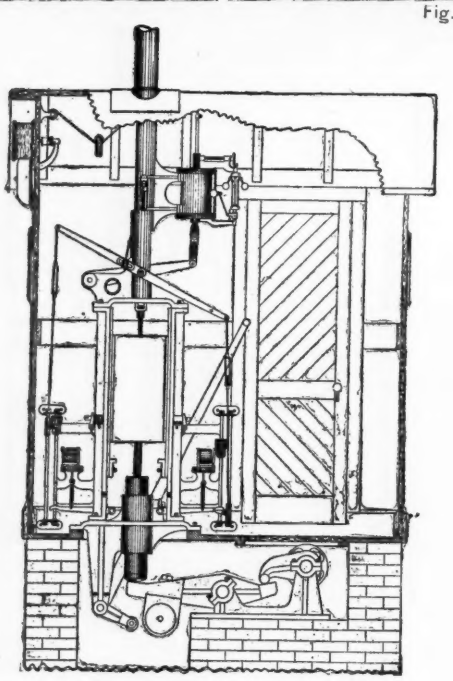


Fig. 2.

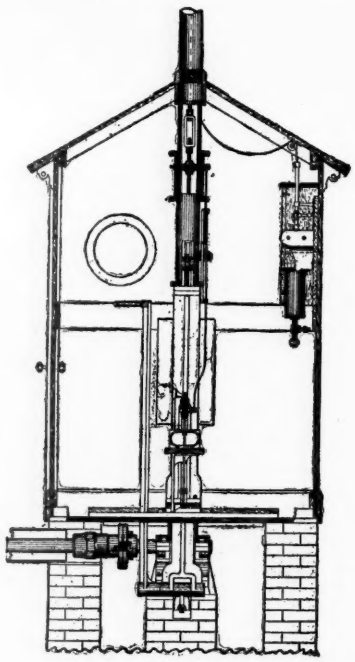


Fig. 3.

Comparative Tests of Cut Nails and Wire Nails.

Messrs. Charles L. Bailey, Arthur B. Clarke and Horace P. Tobey, a committee of Eastern nail manufacturers, have issued a circular giving a summary of the report of Major J. W. Reilly, U. S. A., of a series of tests of the relative holding powers of cut nails and wire nails, made at the Watertown Arsenal last winter. The summary was made by Prof. W. H. Burr, and the substance of it follows:

The series of tests, each series comprising ten pairs of cut nails and wire nails of one size, were, in number, 58

The number of nails tested was 1,160.

The nails ranged in length from 1½ to 6 in.

The number of series in which the cut nails showed the superior holding power was 58.

The number of series in which the wire nails showed the superior holding power was, not any.

All the nails tested were driven in spruce wood.

Additional tests were made, of the box nails only, in pine wood.

In spruce wood, in nine series of tests, comprising nine sizes of common nails (longest 6 in., shortest 1½ in.), the cut nails showed an average superiority of 47.51 per cent.

In spruce wood, in six series of tests, comprising six sizes of light common nails (longest 6 in., shortest 1⅝ in.), the cut nails showed an average superiority of 47.40 per cent.

In spruce wood, in 15 series of tests, comprising 15 sizes of finishing nails (longest 4 in., shortest 1½ in.), the cut nails showed an average superiority of 72.22 per cent.

In spruce wood, in six series of tests, comprising six sizes of box nails (longest 4 in., shortest 1¼ in.), the cut nails showed an average superiority of 50.88 per cent.

In spruce wood, in four series of tests, comprising four sizes of floor nails (longest 4 in., shortest 2 in.), the cut, nails showed an average superiority of 80.03 per cent.

In spruce wood, in above 40 series of tests, comprising 40 sizes of nails (longest 6 in., shortest 1⅛ in.), the cut nail showed an average superiority of 60.50 per cent.

In pine wood, in six series of tests, comprising six sizes of box nails (longest 4 in., shortest 1¼ in.), driven with taper perpendicular to grain of wood, the cut nail showed an average superiority of 135.20 per cent.

In pine wood, in six series of tests, comprising six sizes of box nails (longest 4 in., shortest 1¼ in.), driven with taper parallel to grain of wood, the cut nail showed an average superiority of 100 23 per cent.

In pine wood, in six series of tests, comprising six

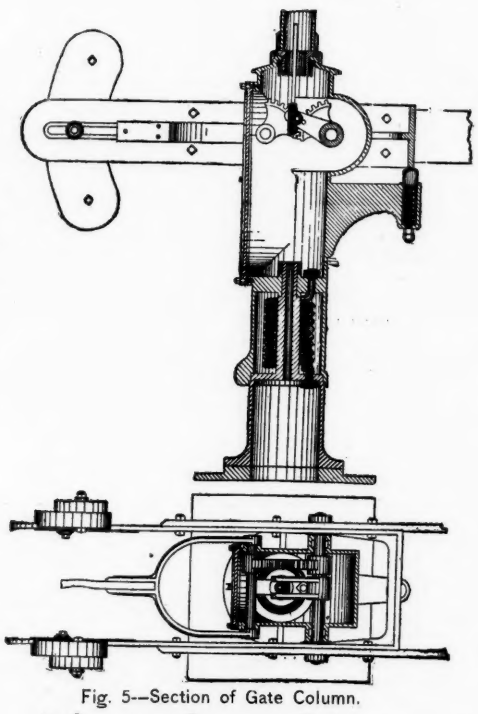


Fig. 5--Section of Gate Column.

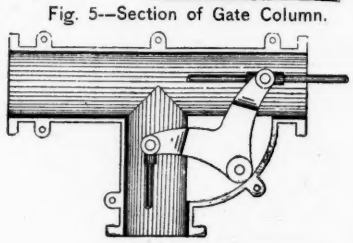


Fig. 4.

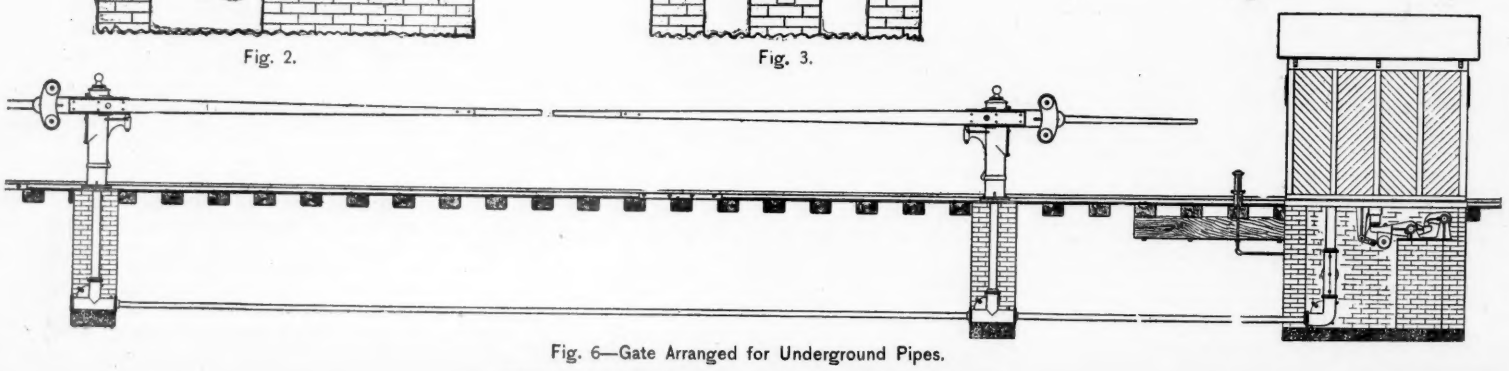


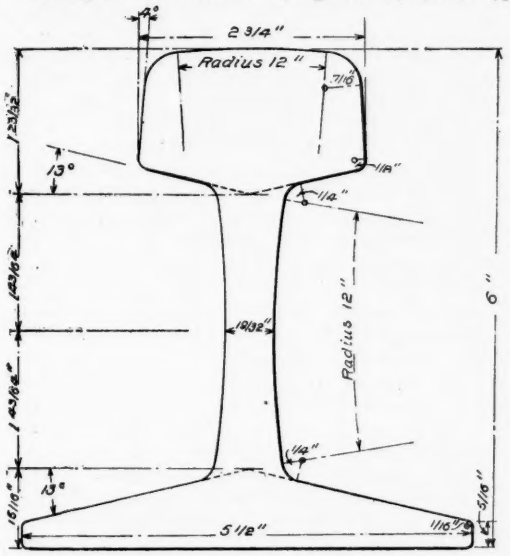
Fig. 6—Gate Arranged for Underground Pipes.

REYNOLDS' AUTOMATIC HIGHWAY CROSSING GATE

sizes of box nails (longest 4 in., shortest 1¼ in.), driven in end of wood, the cut nail showed an average superiority of 64.38 per cent.

In pine wood, in above named 18 series of tests, comprising six sizes of box nails (longest 4 in., shortest 1¼ in.), driven in three ways, the cut nail showed an average superiority of 99.93 per cent.

In spruce and pine wood combined, in the whole 58 series of tests, comprising 40 sizes of nails (longest 6 in., shortest 1½ in.), the cut nails showed an average superiority of 72.74 per cent.



100-Lb. Rail—New York, New Haven & Hartford Railroad.

One-Hundred-Pound Rail for the New York, New Haven & Hartford.

We print herewith a drawing of the section of a lot of heavy rails recently ordered from the Maryland Steel Company by the New York, New Haven & Hartford. The company has ordered 15,000 tons of these rails for use this year, half to be laid on the Hartford Division and half on the New York Division.

The chemical composition of these rails is left to the judgment of the makers, except that it is to be of as igh carbon as they are willing to make and still meet the requirements of section 8 of the specifications and any guarantee which the makers may give the railroad company. Section 8 reads as follows:

"While the heat is being cast two ingots shall be made. The first from steel going into the first regular ingot, the other representing the last one. These test ingots shall be 3 × 3 in. and not less than 4 in. long. From them bars at least ½-in. square shall be drawn at one heat.

"Each bar when cold shall be bent without breaking by the blows of a sledge to not less than a right angle. Should one bar from a heat fail and the other stand the test a third bar may be taken from a bloom rolled from the same ingot represented by the failed one. If this stand the test, it shall be accepted in lieu of the failed bar. If the maker choose, more than two test ingots may be taken, but they must be from the steel of the first and last regular ingots. If this is done, and a test bar fail, another one may be drawn from the duplicate ingot and tested, and if it stands accepted.

"A rail butt from each conversion shall be placed, either head or base upward on solid steel or iron supports, the distance apart of which in the clear shall be 4 ft., and upon them shall be dropped a weight of 2,000 lbs. falling freely from a height of 16 ft. for under 100-lb. and 20 ft. for 100-lb. rail. Should a test fail to stand the drop without breaking a second one may be made. If it also fails, all rails made from that heat shall be rejected, but if the second test stands, then a third one shall be made; if this is successful the rails of that conversion shall be accepted."

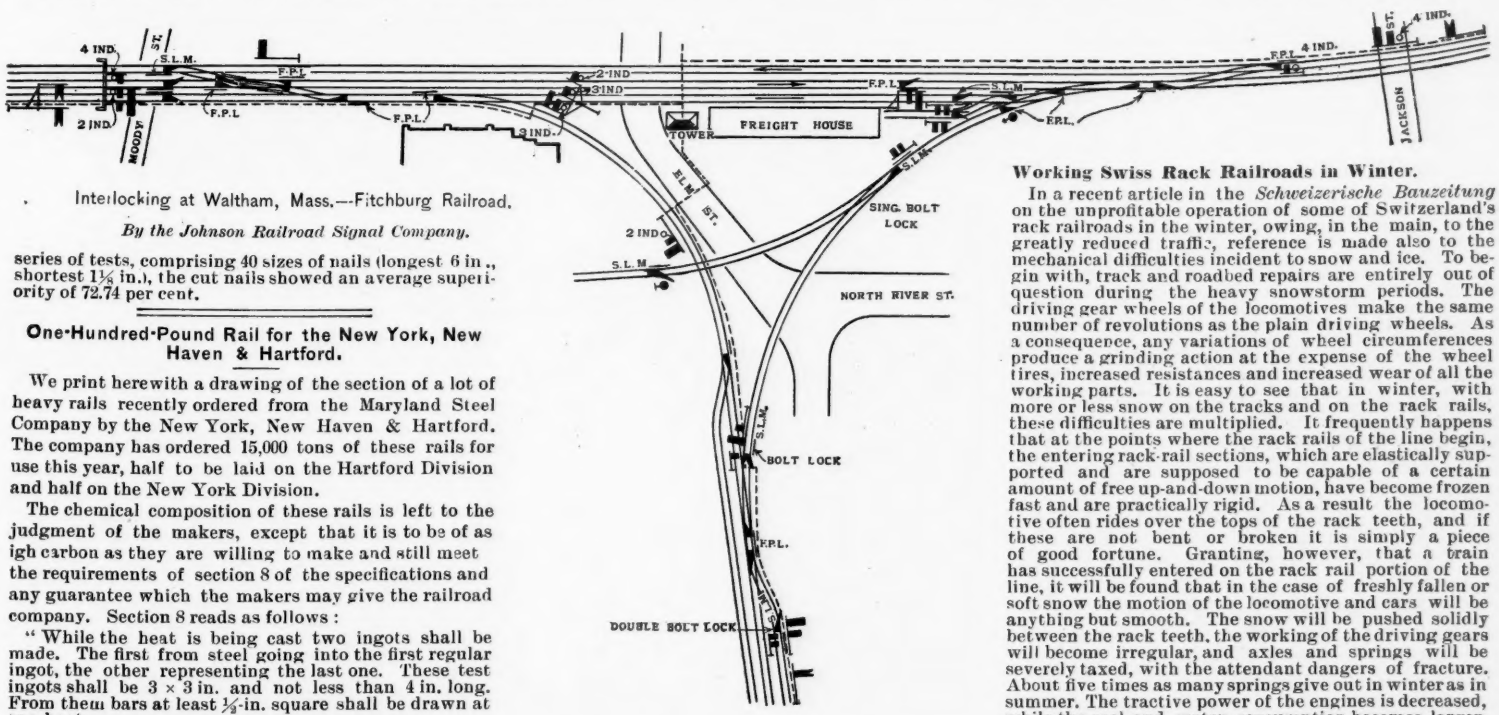
The other specifications, in regard to the treatment of ingots, cutting of blooms, heating, etc., are in the usual form.

The steel in this rail is distributed as follows:

Head	41.65 per cent.
Web	23.65 "
Flange	34.70 "
	100.00 per cent.

Interlocking at Waltham, Mass.

The diagram printed herewith shows the arrangement of switches and signals on the Fitchburg Railroad at Waltham, Mass., where the Johnson Railroad Signal Company has taken the contract to erect a plant as shown in the illustration. Waltham is where the western end of the Watertown branch joins the main line. The machine is the well-known Johnson machine with the locking arranged in one vertical plane. There are 23 levers for signals and indicators, 14 for switches and switchlocks, and 10 for facing point locks, making 47 in all, with five spare spaces. In the diagram the letters S. L. M. indicate a switch which is operated and locked by one pipe line and fitted with a detector bar. The letters F. P. L. indicate the usual arrangement of facing point lock and detector bar.



Interlocking at Waltham, Mass.—Fitchburg Railroad.

By the Johnson Railroad Signal Company.

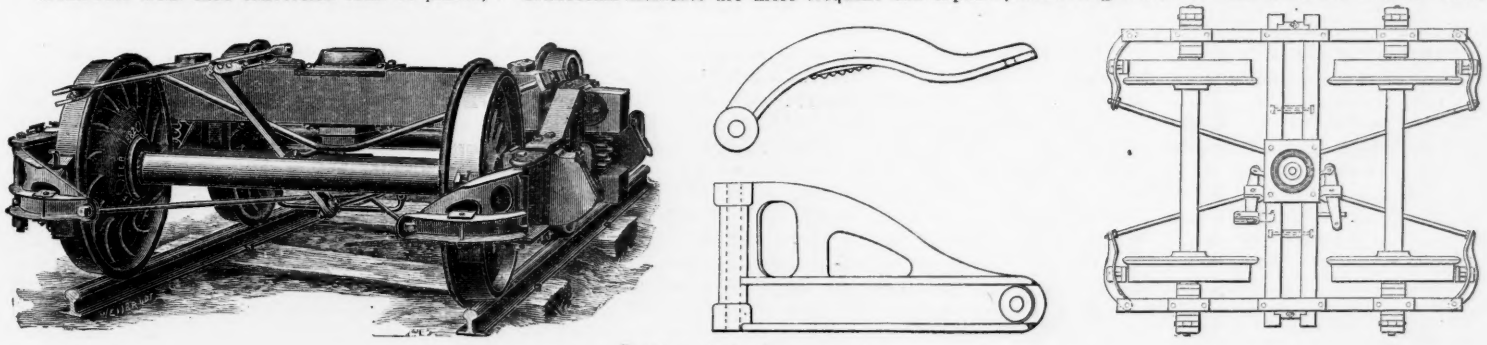
Beamless Brake Gear.

In order to dispense with a brakebeam, the Beamless Brake Company, of Bloomsburg, Pa., has devised the brake gear shown in the engravings. The arrangement is extremely simple and will probably prove to be stiff and to have very little slack.

The essential feature will require the addition of a new term in the Car Builder's Dictionary. It is a curved arm pivoted to an extension of the arch-bar, and connected at the inner end to its brake-rod. This curved arm, or lever, is made of malleable iron and has a corrugated inner surface where the brake block is attached, so that the brake block and shoe can be shifted horizontally ¼ in. in either direction, and always be adjusted for a perfect fit in the wheel tread. A rod runs to the inner end of each of these arms and the rods are coupled to an equalizer.

Brakebeam accidents are more frequent and expensive than commonly thought to be. The *Railroad Gazette's* record for the past two years of accidents due to defective equipment is as follows:

	1892.	1891.
Broken wheel	46	39
Broken axle	56	66
Broken truck	28	38
Failure of drawbar	27	20
Fall of brakebeam	23	27
Other defects	26	25
Total	206	215



Beamless Brake Arrangement.

THE SCRAP HEAP.

Opening Ceremonies of the Great Northern Extension.

Great preparations are being made in the Northwest for the celebration of the completion and opening for business of the Great Northern through to the Pacific Coast. Every town along the entire line is aroused and representatives will be sent to St. Paul from all the principal places to participate in the great demonstration there. This will extend over three days, June 7, 8 and 9, and will include a monster industrial parade, banquet to President J. J. Hill and other appropriate public services. It is thought that this demonstration, especially the industrial display, will surpass anything of the sort heretofore attempted in this Northwest country. After the close of the ceremonies a special train, bearing the officials and distinguished guests, will be started for the Pacific Coast.

Ten Persons Killed by a Runaway Passenger Train.

Passenger train No. 12 of the Cleveland, Cincinnati, Chicago & St. Louis was wrecked in front of the station at Lafayette, Ind., at 1:14 o'clock on the morning of May 7 killing four men on the train and six who were in or around the station. The train became uncontrollable on a long descending grade approaching Lafayette and was thrown off the track when it struck the very sharp curve in the road at the station. The station building was partly demolished and the engine, baggage and mail cars were wrecked. The engineer and fireman were among the killed. It is said that the whistle, calling for the application of the hand brakes, was heard when the train was more than a mile from the station, and the engineer had made efforts to stop for some distance. The reports say that a careful investigation had failed to disclose any evidence of defect in, or mismanagement of the air brake. The wreck was so complete, however, that if the train pipe had been shut back of the tender, evidence of the fact would probably be unobtainable. One report states that the train, as made up at the time of the wreck, had been stopped in the usual manner at several stations. No further particulars have yet been reported.

Working Swiss Rack Railroads in Winter.

In a recent article in the *Schweizerische Bauzeitung* on the unprofitable operation of some of Switzerland's rack railroads in the winter, owing, in the main, to the greatly reduced traffic, reference is made also to the mechanical difficulties incident to snow and ice. To begin with, track and roadbed repairs are entirely out of question during the heavy snowstorm periods. The driving gear wheels of the locomotives make the same number of revolutions as the plain driving wheels. As a consequence, any variations of wheel circumferences produce a grinding action at the expense of the wheel tires, increased resistances and increased wear of all the working parts. It is easy to see that in winter, with more or less snow on the tracks and on the rack rails, these difficulties are multiplied. It frequently happens that at the points where the rack rails of the line begin, the entering rack-rail sections, which are elastically supported and are supposed to be capable of a certain amount of free up-and-down motion, have become frozen fast and are practically rigid. As a result the locomotive often rides over the tops of the rack teeth, and if these are not bent or broken it is simply a piece of good fortune. Granting, however, that a train has successfully entered on the rack rail portion of the line, it will be found that in the case of freshly fallen or soft snow the motion of the locomotive and cars will be anything but smooth. The snow will be pushed solidly between the rack teeth, the working of the driving gears will become irregular, and axles and springs will be severely taxed, with the attendant dangers of fracture. About five times as many springs give out in winter as in summer. The tractive power of the engines is decreased, while the coal and water consumption becomes larger. In running on down grades the motion of the trains is, moreover, exceedingly jerky, the brakes being applied on clear sections of the line, while on others steam must be used. With such irregular working there is always imminent danger of slipping the driving gears. Low temperature induces brittleness in the materials, increasing the number of breaks of all kinds, especially those of car axles.

Instead of making up for high expenses by increasing fares in winter, these are actually about five per cent. lower than in summer. The least reliable of all the parts during winter are said to be the brakes. There appear, in fact, to have been several miraculous escapes from disaster owing to brakes having become inoperative at critical moments. Other elements of danger are introduced by the numerous snowslides which occur every year, and by the carelessness of wood choppers who often allow heavy logs to roll down upon and damage the roadbed.

Taking all these facts into consideration, at least one of the roads—the Berne-Oberland—has petitioned the Swiss Government to sanction discontinuance of operation from Nov. 15 to March 15 of each year.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
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At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

There can be no doubt that the world's record for fast passenger train speeds has been beaten on the New York Central & Hudson River Railroad in the wonderful run made May 9, 1893, by locomotive No. 999. On that day, that engine hauled the Empire State Express from New York to Buffalo, a distance of 440 miles. The schedule of the train is,as we have very often said, 50.7 miles an hour including four stops. The train was 28 minutes late in leaving Rochester, and ran the distance from Rochester to Buffalo, 69 miles, in 68 minutes, making up 15 minutes. In this part of the run one distance of five miles on a level grade was run in 3¼ minutes, being at the rate of 86 miles an hour. This was from Looneyville to Grimesville; and one mile west of Grimesville was run in 35 seconds, being at the rate of 102.8 miles an hour. This mile was also level. The speed was taken between mile posts, by a stop watch, by the conductor of the train. The train consisted of four cars, and the weight of cars and passengers was 362,000 lbs.; the weight of engine and tender was 204,000 lbs. We are indebted to Mr. Wm. Buchanan, Superintendent of Motive Power, designer of this magnificent engine, for confirmation of the particulars given above. The engine itself was shown in our issue of April 28, but we repeat below a few of its principal dimensions:

Cylinders	19 in. × 24 in.
Driving wheels	86 in.
Diameter of boiler	58 in.
Total heating surface	1,930.37 sq. ft.
Grate surface	30.7 sq. ft.
Weight, working order	124,000 lbs.
Weight on drivers	84,000 lbs.
Boiler pressure	190 lbs.

Not the least remarkable part of this performance is that the sustained run of 69 miles in 68 minutes was made after the engine had hauled the train 371 miles; the run of five miles, at 86 miles an hour, was made after a run of 424 miles, and the mile at 102.8 miles an hour after 429 miles had been run. The best previous record of a locomotive with a train we believe to have been one mile run at the rate of 97.3 miles an hour. This was on the Central of New Jersey, and the engine was a Vauclain, four-cylinder compound.

Travel from the Atlantic Seaboard to Chicago is brisk,but not pressing. One road reports that the business to Chicago is about double the usual volume, but that does not mean double-size trains, of course, for these passengers constitute but a small share of the whole load on any particular train. The New York Central last week again changed the date for putting on the 20-hour train, fixing it for May 21. Later it was decided to to wait still longer and as we go to press the advertised time for starting the train is May 28. The establishment of through passenger service on the Nickel Plate road is also postponed. The protest of the Pennsylvania against the quickening of time by the New York Central seems to be persistently pressed, and it has been the subject of much discussion at trunk line meetings. Messrs. Walker, Goddard and Blanchard have made a report on the matter, and it is said that they recommend a fare of $30. This is not given out officially, but the reporters seem to have hit pretty near the facts. This rate means about a cent a mile additional for extra speed, and, if we reckon by the cost and risk, it certainly seems reasonably low. Whether it would be a fair rate from a business view—whether it would attract full trainloads—is not so easy to decide. In view of the remarks now and then dropped by New York Central and Pennsylvania officers about the unprofitableness of the 25-hour trains, on which the extra fare is only $3, it would not be surprising if a ten-dollar premium for speed should dampen a good many passengers' enthusiasm and make them contented with a 26-hour train. It is to be remembered that the Empire State Express carries passengers at regular rates.

No one any longer doubts that the World's Fair will be, simply as a show of methods and products, the finest one ever attempted, but there are many competent and careful men who do doubt its financial success. The expenditure and the operating expenses are enormous, and it is somewhat doubtful if the attendance at the last Paris Exhibition will be equaled at Chicago. Much revenue is expected from the concessions that have been granted, but it is possible, if not probable, that the terms of the concessions have been so severe that in many cases the concessionaries will fail; and at best the amount they can pay will, like gate receipts, depend upon the number of people who attend. It is very questionable if the World's Fair authorities have not overreached themselves in their effort to squeeze the greatest possible amount of money out of the concessionaries; and it is certain that the tradespeople, hotel-keepers, and boarding and lodging-house keepers of Chicago are doing a great deal to discourage attendance. We have repeatedly pointed out that the railroad companies are the only great interest that has made any concessions to induce people to go to Chicago. Everybody else concerned appears to have reasoned that there will be a great volume of business anyway, and that they had better get the ultimate cent out of each unit of business. This policy may seriously affect the success of the Fair, and may indeed turn it from a financial success to a financial failure. Nevertheless, as we said before, its success as a show is certain.

The correspondent who, in a letter on the first page of this paper, again calls up the question of how to manage large freight yards reminds us of a prominent writer on railroad economics who says that all transportation is simply a necessary evil. Assuming that an all-wise Providence ought to have provided a pneumatic tube (operated by a perpetual motion machine) so that Dakota wheat, California gold and Lake Superior iron and copper could be laid down in New York or London without cost or the expenditure of an ounce of human energy he has, of course, an inspiring starting point from which to begin an argument about the amazing way in which American railroads have *almost* achieved this ideal; and he goes on to show in glowing terms how very little thought a Londoner need give to the millionth of a penny that goes to make up the transportation bill chargeable to his daily loaf of bread. Behold, the cost of transportation is an evil, but it is such a very small evil that we may assume that the American railroad manager has entirely abolished it! But the American division superintendent, with 500 carloads of flour for London on his hands,with no ships in New York to take it, with local coal dealers crowding him on one side and 2,000 cars of some other grain coming in on the other side, is confronted by a condition and not a theory, and the evil we are talking about is still a very real one, to him. But the evil is just as great on the main line, at inadequate meeting sidings, at water stations in hollows, and such like troublesome places; and the only way to meet it is to keep up the fight night and day. The precept emphasized by our correspondent, and by what has been heretofore written, is especially to be considered by those who would improve their yards; the corollary of this for those whose yards cannot be altered or enlarged at present is that trains must never be allowed to overtax the capacity of the reception tracks, *as they are*. Better to hold ten trains at ten different stations along the road than to bunch them close to a busy terminal. Better to fight off incoming freight at a dozen connection points than to receive it and set the cars into some "hole" where they cannot be got out for a month. If a certain yard is the weakest link in a 500-mile chain, recognize the fact at once and have the captain of the chain keep his eye on that link. If two or three yards compete for the honor of being the champion clogging point, the general superintendent should keep as close watch of those particular yards as the president does of the Wall street quotations of the company's stock. For one yardmaster to shift difficulties off upon the shoulders of another is as discreditable to the road as a hot box or a broken wheel, and may be more costly.

Large Working Expenses.

The heavy traffic of 1892 as a whole produced disappointing results. The elaborate tables of the *Commercial and Financial Chronicle* published Feb. 25, including 210 railroads and 131,625 miles of railroad, show, it is true, an aggregate increase of 5½ per cent. in gross earnings in 1892 over 1891, but only 2¼ per cent. increase in net earnings, the working expenses having increased 7 per cent. and absorbed 48.7 millions of the total increase of 56.4 millions in earnings, leaving only 7.7 millions additional net for the investors, while there was a gain of 22½ millions in net in 1891 (half of that year unfavorable) over 1890, of 14 millions in 1890 and of 32½ millions in 1889 over the previous years. If we take single railroad systems the increase in working expenses on many of them was still more noticeable last year, and most noticeable of all, perhaps, on the great railroads. Thus the New York Central reports an increase of 8.7 per cent. in working expenses last year, and the percentages of increase of other prominent lines were:

Pennsylvania E. of Pittsburgh	6.2	Chic. & E. Ill	24.4
Pennsylvania W. of Pittsburgh	10.8	Chic., Mil. & St. P.	14.5
Lake Shore	8.0	Chic. & N. W	14.1
Mich. Cen.	7.0	Burl., C. R. & N.	22.2
Clev., Cin., Chic. & St. L.	9.2	Louisv. & Nash.	8.0
		Norfolk & West	17.0

On most roads expenses absorb something like two-thirds of the earnings, and 7 per cent. of them are more than one-half of the amount paid in dividends, taking the country as a whole. The increase in expenses of the Chicago & Northwestern last year was enough to pay nearly 7 per cent. on its common stock, that of the Milwaukee & St. Paul equal to 6 per cent. on its common stock, and that of the Chicago, Burlington & Quincy equal to 5 per cent. on its whole capital stock.

The increase in mileage last year was less than for many years, amounting to only 1½ per cent. on the 210 railroads reported by the *Chronicle*. Reducing the earnings and expenses to the *average per mile of railroad*, the figures reported this year for 210 railroads are:

	1892.	1891.	Increase.	P. c.
Gross earnings	$8,233	$7,892	$341	4.4
Expenses	5,605	5,294	311	5.9
Net earnings	$2,628	$2,598	$30	1.2

While those reported in 1891 for 219 railroads were:

	1891.	1890.	Increase.	P. c.
Gross earnings	$8,137	$7,955	$182	2.3
Expenses	5,532	5,464	68	1.2
Net earnings	$2,605	$2,491	$114	4.6

Thus a year ago we were congratulating ourselves that though only the last half of 1891 had been favorable, the net results were still much improved, because expenses had been kept down; while this year, having seen a large increase of gross earnings for the first eight months of 1892, and a considerable one for the whole year, we gain little in profit because the increase in working expenses per mile is 3½ times as great as from 1890 to 1891, though the increase in gross earnings is not ¼ greater. Of the increase in gross earnings 91 per cent. has been absorbed by an increase in expenses; and some shareholders probably think that, after all, a bad year is about as profitable for them as a good one.

Few companies have illustrated this absorption of increased earnings by increased expenses better than the Chicago, Burlington & Quincy; and its detailed report of the items of working expenses will enable us, we hope, to show where the money has gone, and throw some light, perhaps, on the situation of many other railroads.

The gross earnings of this railroad increased, from 1891 to 1892, no less than $5.086,266, or 8½ per cent., but its increase in net earnings was only $1,219,438, owing to an increase of $3,866,828, or 22.3 per cent., in its working expenses. There was some increase in the average length of road worked, but only 3½ per cent., and there was a very large increase in traffic, 12½ per cent. in passengers and 30 per cent. in freight, equivalent to about 25 per cent. in all; but ordinarily a large increase in traffic can be handled with a comparatively small increase in expenses. Nor were there any considerable changes in rates of wages and prices of materials.

Let us go into the details of the expenses and see if this great increase was general.

The first four items of expenses in this company's report are: train service, engine service, station service and water service. These in the aggregate made nearly 46 per cent. of the total expenses last year.

They were in the aggregate 17 per cent. more than in 1891. Train service, which is likely to vary most closely with the traffic, increased 20 per cent., and engine service 17½ per cent.

We pass now to the maintenance expenses, reported under seven heads. These were, taken together:

	1892.	1891.	Increase.	P. c.
Maintenance.....	$8,343,521	$6,407,360	$1,936,161	30.2

Here we find one-half of the total increase in expenses, and a proportion of increase much more than the average and more than the increase in traffic—nearly twice as great as the percentage of increase in the "service" departments.

Looking at the details under maintenance, we find an increase of no less than 38.8 per cent. in the cost of repairs of track, of 36 per cent. in repairs of bridges, and of 41 per cent. in repairs of buildings. The increase in car and locomotive repairs was more nearly in proportion to traffic—22 per cent. in car and 17½ per cent. in locomotive repairs.

In examining this company's recent history last year (April 8, page 266), we found that its maintenance expenses had varied comparatively little in the seven years from 1885 to 1891, though its mileage had grown 50 per cent. meanwhile, and its other working expenses 47 per cent. We copy below the table then given of the cost of car repairs *per car*, of locomotive repairs *per locomotive*, and of all other repairs (track, bridges, fences, buildings, docks and levees), *per mile of railroad*, adding the figures for 1892:

Year.	Car repairs per car.	Loco. repairs per loco.	Other per mile.	Year.	Car repairs per car.	Loco. repairs per loco.	Other per mile.
1883	$62.46	$1,799	$1,135	1888	$58.26	$2,011	$765
1884	62.45	1,686	985	1889	62.75	1.838	623
1885	59.16	1.821	1.056	1890	52.38	1,793	691
1886	49.90	1,532	996	1891	57 65	1.684	653
1887	56.53	1,531	979	1892	65.88	1,816	877

Here we see that last year all these items were much larger than in 1891, car repairs per car the largest for the ten years, and locomotive repairs per locomotive much above the average of that period. It is to be remembered that the average size and capacity of both cars and engines have been increasing of late years, so that larger cost of repairs of each was to be expected. It is the other repairs, track, bridges, buildings, etc., which show the most astonishing increase last year, however, amounting to 34 per cent.

Track repairs, much the largest single item, have been for ten years, per mile of railroad, in dollars:

1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.
904	764	797	752	734	562	454	506	508	683

The amount last year was not only 34½ per cent. more than in 1891, but equally as much greater than the average of the four years from 1888 to 1891, though still less than in any of the previous years.

We intimated last year that the very great falling off of traffic on this railroad after the bad crops of 1890, causing a serious decrease in earnings in the last half of that year and the first half of 1891, had induced a "heroic" reduction of working expenses, and especially maintenance expenses, as indicated by the fact that "repairs" of all kinds cost 24 per cent. less in the first half of 1891 than in the corresponding half of 1890. But a still more striking indication is afforded by comparing the total maintenance expenses for the 12 months ending with July, 1892, with those of the previous 12 months, which were substantially the year of bad business, and with the 12 months to July 31, 1890. They were:

	Year to July 31.		
	1890.	1891.	1892.
Maintenance.....	$5,652,570	$5,495,728	$8,134,889

Thus the "saving" in maintenance expenses in the bad year ending with July, 1891, compared with previous 12 months was $1,136,842, or 20 per cent., but these expenses in the following 13 months were $2,639,-161, or 48 per cent. larger than in the bad year—a truly enormous increase. But, comparing the last with the first of the three 12-month periods, the increase was $1,502,319, or 23 per cent.

It is difficult to avoid the conclusion that a considerable part of the repair expenses of the last year were for work postponed from the previous unfavorable year. And however it may have been in this particular case, there is no doubt whatever that a very large part of the increased expenses last year of many railroads in this country was caused by their doing in 1892 what they would have done the year before if earnings had not been light; and doubtless, as usual under such circumstances, they have often had to pay what is equivalent to a very high rate of interest on the money "saved" in this way. For this reason we are inclined to regard the very large working expenses, so commonly reported for a year and more past, as a decidedly favorable feature. The money has not been thrown away, and if it will not always produce large future gains in net earnings it will generally prevent large losses.

The West Albany Brake Trials.

In the *Railroad Gazette*, Feb. 24, 1893, was given a pretty complete analysis of the brake trials of the Westinghouse and the New York air brakes, at Karner, near West Albany, on the New York Central & Hudson River Railroad. In general, the analysis showed that

The length of stop with the New York brake is greater than it should be in an emergency application on account of the time required to gain full pressure in the cylinders.

The emergency action with the New York brake will not pass a gap of three cars in a train with certainty; that is, when three cars consecutively are cut out in a train the emergency action cannot always be obtained.

The shock with the New York brake when measured with a slidometer averaged 28½ in., which is 2⅛ times the limit set by the Master Car Builders' Association, viz., 12 in.

The No. 2 New York triple does not release with certainty.

The No. 2 triple valve does not give such action to the New York brake as to make it uniform in operation with the Westinghouse brake.

All of these conclusions were easily deducible from the information which we were able to collect concerning the results of the West Albany trials and which appeared in our issue of Feb. 24. From the text of the official report which is now made public, and extensive extracts from which are printed in this issue, ample confirmation may be had of all of these conclusions, and, furthermore, one may find from an inspection of the record of the graduation tests, that in these also the New York brake showed its great inferiority to the Westinghouse. It will be seen that while in the successive applications the Westinghouse brakes applied promptly in each case, 11 of the New York cars did not apply beyond the leakage groove at the first trial and in the second trial the brakes on six cars failed to apply beyond the leakage groove. Further, it is an important circumstance that three of those brakes which applied in the first trial were inoperative on the second, which shows a grave defect in the New York brake—namely, a want of reliability in action. And it appears further that these brakes leaked off fast after the application.

Test No. 10 was a holding-on test, with service application, 15 lbs. of air being admitted to the cylinders and the pressure noted at the fifth, tenth and fifteenth minutes. All of the Westinghouse cars applied and only three are reported as having leaked off. One of these was a car with a defective gasket. This was No. 46,374, and this brake leaked off in all of the tests of this character. Another one, the fiftieth car, leaked off at the end of 11 minutes, but in this case the leakage may properly be attributed, as is suggested by Mr. Dudley himself, to the connections to the indicator in the dynograph car. The third car reported as having leaked off did not belong in the Westinghouse train. There is a mistake either in reporting its number or in the train to which it was assigned. We may say, therefore, that all of the Westinghouse brakes remained on 15 minutes. On the other hand, six of the New York cars went off in five minutes and two more in ten minutes; the others held on 15 minutes.

Test No. 11 was similar to No. 10, except that all of the air was exhausted from the train line by an emergency application. In this test the Westinghouse brakes all remained on 30 minutes, except No. 46,374, the brake with the defective gasket mentioned above. In the New York train three cars had gone off in seven minutes; in 12 minutes three more; in 15 minutes three more and in 18 minutes two more; that is, at the end of 18 minutes 11 brakes had gone off. Some of the New York air-brake people found that at the end of 20 minutes there was 16 lbs. pressure in the train pipe, which was considered as being the cause of the release and as vitiating the experiment. Mr. Dudley offered to repeat the experiment, but this was not done. The fact is, that the handle of the engineer's valve was found to be "on lap," and the 16 lbs. of air in the train pipe must have been due to leakage through the triples, which was exactly one of the points to be ascertained. Furthermore, the brakes which went off in 20 minutes must have been released by train-pipe pressure somewhere below 16 lbs.; consequently, they must have leaked down to such a pressure; and the faulty construction of the New York triple which would be indicated by this leakage is further indicated by test No. 12. By a careful comparison of the train-pipe pressures of the two brakes in that test, one is led to the conclusion that the New York train-pipe filled fast during the first five minutes, from the brake cylinders. For in this five minutes the pressure in the New York pipe rose to 22 lbs., while in the Westinghouse it rose to 10.5 lbs. In the second five minutes the pressure in the New York pipe rose 18 lbs.; that is, to 40, while in the Westinghouse it rose 28.35 lbs., to 38.85. In the next five minutes the pressure in the New York pipe rose but 7 lbs., while in the Westinghouse it rose 14.7 lbs. So we may conclude that in the first five minutes the pressure from the brake cylinders of the New York train leaked into the train pipe rapidly. In the second five minutes it leaked more slowly as the pressure had become more nearly equalized; and in the third five minutes the pressure in the train pipe rose slowly because so much air was required to recharge the reservoirs of the brakes which had released. The rate at which the cars in the two trains released in this test may be best compared by tabulating the results. In the table below the figures in the second and third columns show in each case the number of cars released in each period and not the totals up to the ends of the periods.

	Cars released.	
Minutes.	New York.	Westinghouse.
2	1	..
3	3	..
4	4	..
5	3	1
6	6	2
8	10	..
10	7	6
11	..	7
12	..	9
14	11	..
15	..	10
18	..	12

We are informed that the one car on the Westinghouse train which released in the first five minutes was the unfortunate No. 46,374 with the bad gasket. In the same time 11 of the New York brakes, or 22 per cent. of the whole number in the train, had released, and of course would have been useless in holding a train down a grade. It will be seen that at the end of 10 minutes 34 New York cars had released, as against nine, or eight if we omit No. 46,374, on the Westinghouse.

To the conclusion stated in the remarks on test No. 6 that the New York brake gets a higher cylinder pressure in the emergency application than the Westinghouse, we attach no importance, for the observed increase is only "one to two lbs.," and we do not believe that Mr. Dudley would wish to rely upon his air gauges for the determination of so small a difference.

The seventh test was a very important one. It was to determine the action of the brake with part of the cars cut out. In each case the fifth, sixth and seventh cars were cut out. Three trials were made of the Westinghouse train, in all of which the emergency application on the 50th car was obtained promptly and efficiently. On the New York train the emergency application was also got in the first trial; the second, third and fourth trials failed. In the fifth trial the engineer's valve was held open two seconds, and in that case the brakes applied on the 50th car. The times between the movement of the engineer's valve and the beginning of the application of the brakes on the 1st and 50th cars of each train, in each one of the successful trials, are given in the following table, in seconds:

	1st Car.	50th Car.	Difference.
New York 1st.....	0.2	3.7	3.50
5th.....	0.2	4.2	4.00
		Average.....	3.75
Westinghouse 1st.....	0.2	2.60	2.40
2d.....	0.2	2.70	2.50
3d.....	0.2	2.70	2.50
		Average.....	2.47

It will be observed that the interval between the beginning of application on the 1st car and on the 50th car averaged, in the case of the New York train 3.75 seconds, and in the case of the Westinghouse train 2.47 seconds. With the Westinghouse train this interval was actually less than it was in the tests where the brakes were all acting. In the New York train it was .68 second greater than when all the brakes were cut in, and 1.28 seconds greater than with the Westinghouse train under the same conditions. From these figures it is evident that if the emergency application of the brakes on the rear of the train can be got at all with the New York air brake as used at the West Albany trials, it will only be with destructive shocks—far greater shocks, indeed, than those which were experienced in the actual running trials, and those were more than twice as great as the Master Car-Builders' specifications permit. But it appears further that the chances are against getting any brake application on the rear of the New York train with three cars cut out, and we need not point out the very serious nature of this defect in the action of the brakes.

The matters that we have touched upon will seem to some, perhaps, to be refinements. Of course they are not. Of course a brake which will not hold a train down a grade and which will not jump two or three cars cut out is not a reliable air brake. It would have answered a few years ago, when there was nothing better, but now that there is something better it would be unpardonable carelessness or ignorance for a railroad

officer to buy such a brake. But there is one very apparent result from these tests which nobody could look upon as a mere refinement, and that is, the much greater efficiency of the Westinghouse air brake in the emergency stops. Here we find a very striking difference in favor of the Westinghouse brake. The average length of the four emergency stops is 365 ft. for the Westinghouse and 418.25 for the New York, being 16.2 per cent. longer for the New York trains. If, however, we correct the stops for errors arising in the record from the break-in-two cases and for difference in train-pipe pressures and reduce all to a uniform speed of 30 miles an hour, we shall find that the New York train traveled something over 18 per cent. further than the Westinghouse.

The great differences shown in these two trains in the matter of shock were pointed out and discussed in our former article on the subject, and we can add nothing to what was said then. It will be well enough to observe, however, that the shocks in the Westinghouse train were, minimum, ½ in., maximum, 6 in., average, 5½ in., New York, minimum, 26½ in., maximum, 31 in., average, 28½ in.

We have now given all of the important trials of the New York brake up to this time. The general results are as follows: The first trials on the Burlington road showed the brake to be without quick action and the shocks to be very great. The triple valve was then changed to get a quicker action. The triple used was No. 1. At the second trial on the Burlington, the brakes would not release, and it was claimed that the defect was due to imperfect workmanship. The triple used was the No. 2. In the trial on the Lehigh Valley Railroad, the triple valves were of better workmanship, but they still would not release. The triple used was the No. 2. In the West Albany brake trials, where the conditions were more comparable than in any of the preceding trials, and the brakes were made as well as they can be expected to be by any new firm, there was much leakage of the triple valves, and the shocks were nearly double the limit prescribed by the Master Car Builders' Association committee. The triple used was the No. 2. The No. 3 triple, which is now being sold, differs materially from the No. 2 triple, and has been devised to prevent leakage; but the change to gain tightness has been made by putting a slide valve on the graduating piston, which must increase the friction of movement of that piston, and possibly will interfere seriously with the graduation on long trains. Any tests that have been made of the No. 3 triple have not been made public, and it is not known how this triple will act under service conditions.

From all this and the preceding accounts of brake tests, railroad officers can see how important is the work of the committee appointed to devise standard tests for air-brake apparatus. For the safety of trains, railroad companies are more dependent on brake apparatns than upon any other device, not excluding wheels, axles, couplers, and signals; and as brake apparatus is, when compared to other train devices, a very complicated mechanism, it is desirable that the work of examination of new forms of brakes should be allotted to an expert committee of the Master Car Builders' Association, who would not only be keenly alive to the best interests of the railroads, but would put time and work into investigation. At the World's Fair there are several large and elaborate testing racks containing, except in one case, 50 sets of brakes, and in that case 100; and those who care to investigate for themselves the comparative merits of the air brakes now offered for sale will find opportunities in the Transportation Building for making the most exhaustive shop tests that can be made with present information. Taken altogether, the brake question, about which so much has been written, still remains one of the most interesting and important matters before railroad officers. Perhaps the increasing demand for long high-speed freight trains and the need for greater braking power for high-speed passenger trains are the two principal factors which now keep up the interest in this matter.

The Transportation Exhibit at the World's Fair.

The transportation exhibit at the World's Fair is still incomplete; but perhaps it is the most complete of any of the exhibits, and it is certainly so far advanced as to give a good notion of its scope and of the number and variety of objects to be displayed. Much the greater part of this exhibit was in place at the beginning of this week, but the means of getting information as to the articles displayed were still very imperfect, as few of the exhibitors were to be found, or they were busy in finishing the arrangement of their displays. Still, there are some advantages in going now, for there is plenty of room to go about and see things without being crowded.

A very important part of the transportation exhibit is outside of the grounds—that is the means of getting to the Fair. Of these we have had considerable to say in the past, and probably shall have something to say, incidentally, in the future. Last week we spoke especially of the Alley Elevated Railroad, which has been so remarkably well organized and equipped. We spoke also of the Illinois Central, but did not do justice to the admirable preparations that have been made by that company.

It is no longer a question with the Illinois Central of its ability to handle the World's Fair traffic, but rather whether the traffic offered will come up to the preparations made to handle it. In a speech made at the dinner given to Mr. James Dredge by the Western Society of Engineers last week, Mr. Wallace, Chief Engineer of the Illinois Central, gave some interesting particulars of the work that has been done in permanent improvements of the Illinois Central's Chicago terminus and in the preparations for the temporary traffic of the World's Fair. At the old station, the business in and out had to be handled on six stub tracks for all service. There are now eight main tracks which run through the main depot at the foot of Twelfth street which is now approaching completion. The suburban and World's Fair stations are further up the lake, the suburban terminus being at the old station at the foot of Lake street and the World's Fair terminus at the foot of Van Buren street; at the latter place 12 ticket booths are provided. The World's Fair service is complete in itself. The trains are run through from the foot of Van Buren street to the station near Jackson Park without stop, making the run nominally in 15 minutes, but frequently in 13. The cars have cross seats and side entrances, and a 10-car train holding 960 persons can be emptied in 30 seconds. In fact, by actual time, on the opening day, only 30 seconds was occupied from the stop to the start of one of these trains at the southern terminus. For this service 300 cars and 40 locomotives have been provided. The cars have freight trucks with improved springs and freight car bodies with M. C. B. couplers and Westinghouse air brakes. When the need for them at Chicago is passed they will be slightly remodeled and put into the express fruit business from New Orleans. How important this trade has become with the Illinois Central may be judged from the fact that in one day that road has brought into Chicago 130 carloads of bananas.

In remodeling the terminus and before building the new station the yard at Twelfth street had to be entirely changed and the locomotive repair shops removed. These were taken out to Burnside, on the line of the road where new shops are being built, to cost from $400,000 to $500,000. Then the tracks were raised for a distance of 2½ miles at a cost of $1,269,000. In this 2½ miles 13 streets were passed under the tracks, and, instead of closing any streets, five or six streets were opened up to the lake front. The company has also provided for country excursion business to the Fair, having established a through-track station at the Midway Plaisance, and it has waiting-room under the tracks at that point for over 1,800 persons. Altogether, this has been one of the most important city terminal improvements made in any city in recent years, and it is probable that when the World's Fair business is over and forgotten the Illinois Central people will be very glad that they were forced to do this work now.

The Hall track-circuit block signals on this line are another important exhibit. Indeed this is the only exhibit made by the Hall company at the Fair.

Within the grounds and still not in the Transportation Building, are several things of special interest to railroad men. One of these is the Intramural elevated railroad. This is an electric railroad, run from a central station, with motor trucks under the first car of each train. It is the purpose to run trains of four cars at considerable speeds, with frequent stations. The structure is worth looking at, for if the road is successful mechanically this will be an example of a cheap and possibly adequate structure for similar purposes. The central power station is a good example, and will be described at considerable length in a later issue. A general description of the whole plant appeared in our issue of March 31.

The Multiple Speed Railroad, of which we have said more or less in times past, and the latest form of which is shown in this issue, is also an interesting transportation exhibit It embodies principles and methods which may be practically applied hereafter in many places if they are successful here. This enterprise is an illustration of the burdensome terms of concessions, of which we have spoken in another place. The proprietors had to pay to the World's Fair authorities a cash bonus of $25,600, and must pay in addition one-third of their gross receipts, leaving a pretty narrow margin from which to pay operating expenses and the actual cost of construction and installation, to say nothing of a profit on the enterprise.

The Grand Terminal Station and its tracks are also worth looking at, and here the visitor will see a novel interlocking arrangement, the Wuerpel. This terminus will be described at length in a later article.

Outside of the Transportation Building will be found also the special exhibits of the Pennsylvania Railroad, the New York Central Railroad and the Krupp Works, all of which will be of great interest, but none of which are yet completely installed.

The main Transportation Building is 250 ft. × 960 ft., and has an annex covering over nine acres. The annex is one story high, but the main building has two stories, the second floor being open through the centre, giving galleries and offices on the sides. The scheme has been to collect in this building a comprehensive display of all human means of transportation adapted to the heaven above, the earth beneath and the water under the earth, and representing all historical ages. It is probable that the collection of objects has fallen short of the aim of the projectors in one way at least, and it is fortunate that such is the fact; that is, few novelties are shown which are merely novelties. The collection exhibits mostly standard practice in various ages and countries, and is pretty closely confined to the surface of the earth. Indeed, it is somewhat astonishing to see how crudities and mere speculations have got weeded out. A few reminders of old times may be seen in revolutionary car couplers, and one pathetic individual is on the ground with his couplers mounted on trucks which he slowly pumps back and forth on a little track to show how beautifully they will couple. It is sad to think how tired he will get in the next six months as the stream of general managers, master car builders and master mechanics flows past him, hardly stopping to see him pump, and not a single man of them pausing long enough to order 10,000 couplers. "The only rational rail joint," too, is very sparingly represented, and we saw but one epoch-making locomotive.

The locomotive exhibit, as a class, is the best thing in the Transportation Building. Most of the large firms of builders in the United States are represented as well as several railroad companies, and the engines shown range from a four-cylinder compound decapod weighing 96½ tons down to a "midget" designed for a mill yard. The locomotive exhibit is almost entirely domestic. There are, we believe, but nine foreign engines shown, and two, at least, of these are not now standard types. This is rather unfortunate, for many Americans who will never go abroad would have liked to have a chance to see something of foreign locomotive practice.

The exhibit of the Baltimore & Ohio Railroad, as we have repeatedly said, is intended to be a comprehensive display of the development of the locomotive engine from the earliest times. This is made up partly of models and partly of actual engines, and will be one of the most popular and one of the most instructive collections to be seen at the Fair. It has involved a great amount of work, and the record of it should be made permanent in a handsome illustrated volume.

In cars there is a fair domestic exhibit, but quite a meagre foreign one; but the domestic exhibit of cars is not so good as that of locomotives, and there is not a very good opportunity to get a complete view of American practice, in freight cars especially, as none of the great builders exhibit them. The showing of special cars, such as stock, horse and refrigerator cars, is quite large. There are some very beautiful displays of passenger cars both of home and foreign makes, and there are one or two German cars for freight service that are worth looking at; in fact, the American designer can get some valuable lessons in the foreign exhibits, even if the types shown are not applicable to American uses. Many of the details of the foreign cars and locomotives show an elegance of line and proportion which our designers might imitate without any sacrifice of economy or practicality, and with very decided gain in appearance.

Why the Bethlehem exhibit is placed in the Transportation Building is not exactly clear, although it is probably because of the convenience in handling the very heavy pieces which that company shows. This exhibit includes a model of the great hammer at Bethlehem, a big gun and some very heavy forging.

Some remarkably interesting drawings are shown in this building, including plans of German yards and stations, the display of the Associated German Engineering Societies and the bridge plans prepared by Mr. Theodore Cooper for the Baltimore & Ohio, a list of which appears elsewhere. The plans illustrating the St. Gothard railroad which hang on the wall at the north end of the main building are also interesting.

The marine exhibit is very fine. There are many beautiful models of vessels and a large display of special machinery such as steam capstans, steam steering gear, etc., and the display of bicycles and carriages is large and very handsome.

The Lake Shore & Michigan Southern and the Chicago, Rock Island & Pacific roads, which have been considering the subject of block signals for some time, have finally taken action, both having given contracts to the Hall Signal Company this week. The Rock Island will put in automatic block signals, operated by wire circuits, between Mokena, Ill., and Joliet, 10 miles. Plans have been prepared for blocking a good deal more than this, but this is all that will be done just now. The Lake Shore will put in about 31 miles of automatic block signals, to be operated by track circuits, the signals to stand normally at danger, as in the installation at Kansas City, illustrated in the *Railroad Gazette* of Jan. 13 last. These signals are to be put in on three different sections of the road; on the Western Division from Durham to Burdick, 8 miles, and from Rolling Prairie to Terre Coupee, 8 miles; on the Air Line

Division from Goshen to Ligonier. 15 miles. The Hall Company will also put in some of its automatic highway crossing bells for the Rock Island road, and has taken a contract for crossing bells to be erected on the Louisville & Nashville.

The May returns of the Department of Agriculture on the condition of winter wheat show a reduction of 2.1 points from the April average, being 75.3 points against 77.4 last month and 84.0 in May, 1892. Winter rye has also suffered a decline in condition since last month, its average for May 1 being 82.7 against 85.7 for same date in April. The average condition of barley is 88.6 against 92.8 last year.

TRADE CATALOGUES.

Randolph & Clowes, Waterbury, Conn. Price List of Seamless Brass and Copper Tubing, Sheet Brass, etc. Price lists, as they are understood by many, are comparatively uninteresting literary products, except in so far as they appeal to the pockets of buyers and sellers. This "Standard Price List," however, recently issued by Randolph & Clowes, the well known manufacturers of sheet brass and copper, seamless drawn brass and copper tubing and allied products, is something more than its name implies, giving not only prices, but also a mass of other valuable information, which engineers and the trade generally will appreciate. On the vexed gauge question, for instance, the catalogue gives tables showing the differences between the several wire gauges in use, the equivalents in common fractions of an inch of different gauge numbers, and decimal equivalents of 8ths, 16ths, 32ds and 64ths of an inch, for use in connection with the micrometer gauge, thus tending to make clear to prospective buyers a subject concerning which there always is more or less annoying confusion. Then comes a series of comprehensive tables of seamless drawn brass and copper tubing, of different gauge thicknesses and from $\frac{3}{16}$ in. to 16 in. in diameter, giving not only the prices per pound of each variety, but also the approximate weights per running foot. Some of the tubes—those ranging from $\frac{3}{16}$ in. to 8 in. in diameter—are turned out in exceptionally long lengths, an accompanying photograph showing a lot of tubes 38 ft. long. A table of brass and copper tubes of iron pipe sizes gives also the actual outside and inside diameters in decimal equivalents. Still another table furnishes data for finding the weights when the inside diameters are known. Similarly comprehensive tables are given for sheet copper and brass, round bolt copper, spun brass kettles, etc. The catalogue was evidently compiled after long and careful work, and the figures for weights and gauges are exceptionably thorough and reliable and have already elicited much favorable comment. An index is appended for convenient reference. Mr. Theo M. Baker, the Philadelphia agent of this house (333 Walnut street), informs us that it secured the contract for supplying the sheet copper for the Pennsylvania Railroad company's new train shed at Philadelphia. The roof alone required 125,000 lbs. of cold-rolled, patent-leveled sheet copper.

The Brown & Sharpe Manufacturing Company, of Providence, R. I., issues what it calls a contribution to the literature of the World's Columbian Exposition. It is a 64-page pamphlet containing an account of the works of the company, a brief description of Providence, Newport, Boston and Chicago; some interesting statistics, a number of suggestions in regard to living and traveling in America, a cable code, views of Exposition buildings, etc. This book will be mailed without charge upon application. The pamphlet is a very pretty one and so intelligently compiled as to be really useful to a foreigner traveling in America.

The exhibit of the company at the World's Fair was ready at the opening, being in place before the exhibit of any other maker of machinery for working iron and steel. This exhibit comprises 40 machines and more than 1,500 tools, and is placed in the Machinery Hall annex.

The Buffalo Forge Company, of Buffalo, N. Y., has issued a large new general catalogue, which is very full and complete. There are nearly 300 pages and a great many illustrations. The fans, stationary engines, blowers, blacksmiths' drills and forges, etc., are perfectly illustrated by drawings and perspective cuts, and the book is also embellished with direct process cuts of handsome buildings ventilated by this company's apparatus. This book, like former editions, contains much valuable data concerning the movement of air by fans and the resistance of air in pipes. There is a good index.

World's Fair Exhibits of Special Interest to Engineers.

In the Transportation Building at the World's Fair appears a remarkably interesting collection of drawings of American bridges which was prepared by Mr. Theodore Cooper, of New York, for the Baltimore & Ohio Railroad Company. The drawings are quite fully dimensioned, and illustrate the history of American bridge building from 1804 to 1892. The collection has involved a considerable expenditure both of money and of time, and has been a labor of love on Mr. Cooper's part; and it constitutes a most valuable contribution to the World's Fair. A list of the plans shown follows.

Trenton arch bridge, 1804, 1848, 1869.
Harper's Ferry Bridge, timber, by Latrobe, 1836.
Harper's Ferry Bridge, iron, by Bollman, 1852.
Colonel Long's Truss, 1st form, 1833.
Colonel Long's Truss, 2d form, 1837.
Town's Wooden Lattice, 1820, 1851.
Burr arch bridges, 1832 and 1849.
Cascade arch, Erie Railroad, 1848.
Standard arch bridge, adopted during construction of Erie Railroad, 1849.
Howe's Springfield bridge—first Howe railroad bridge, 1838.
Howe's, Salisbury, Conn. 2d form of Howe's truss, 1870.
Pratt's truss bridge, Newburyport, Mass., 1877.
MacCallum truss bridge, Erie Railroad, 1851.
Portage Viaduct, timber, Erie Railroad, 1852.
Portage Viaduct, iron, Erie Railroad, 1875.
Millholland's plate girder, 1846-7.
Fink's Monongahela, 1851-2.
Fink's Louisville, 1868-70.
Fink's combination bridges.
Fink's Tray Run viaduct, 1853.
Whipple's truss bridge, Erie Railroad, 1847-8.
Whipple's truss bridge, Rensselaer & Saratoga Railroad, 1852-3.
Whipple-Murphy bridge, 1859.
Lowthorp's truss bridge, 1860.
Early Howe truss in iron, Boston & Providence Railroad, 1849.
Post's first bridge, Washingtonville, Erie Railroad, 1865.
Smith, Latrobe & Co.'s iron trestles, 1867-8.
Lowthorp's cast iron trestle, Jordan River, Pa., 1856.
Linville's arsenal bridge 1859-60.
Linville's, Steubenville, 1863-4.
Juniata No. 8, cast iron arch bridge, Pennsylvania Railroad, 1864.
Rockville wooden arch bridge, Pennsylvania Railroad, 1848-9
Victoria tubular bridge, 1859.
Roebling's Niagara, 1852-3.
Kentucky River bridge, 1876-7.
David Lyman viaduct, 1869.
Kinzua viaduct, 1882.
Pecos River viaduct, 1891.
New Jordan River viaduct, 1889.
Fishing River bridge, Chicago, Milwaukee & St. Paul Railway, 1886.
Memphis bridge, 1892.
300 ft. Combination bridge, Northern Pacific Railroad, 1886.
Cairo bridge, 1888-9.
Bellefontaine bridge, under construction.
Modern Type arched Howe Truss, 1890.
Bridge 73 Susquehanna Division, Erie Railway, 1891.
Trenton Falls bridge, 1891.
Canastota bridge, 1865.
Photograph of Red Rock bridge, 1890.
Photograph of Memphis bridge, 1892.
Photograph of Ohio River bridge, Chesapeake & Ohio Railway, 1888.
Photograph of Devil's Gate viaduct, 1883.
Photograph of Pecos Viaduct, 1891.

This collection is displayed in the gallery of the Transportation Building. At the north end of the main floor hangs a series of plans and views showing certain features of the St. Gothard railroad. These include three relief maps which show the development of the line at three different points, including five spirals in tunnels and two great loops. These are all contoured and colored, showing the elevations and geological formation. In the same collection are 15 water colors by Weber, of Zurich. These show characteristic landscapes on the line of the railroad.

Statistics of the American and Foreign Iron Trades for 1892—Annual Statistical Report of the American Iron and Steel Association.

Mr. Swank has added to his usual full annual report the paper "Twenty Years of Progress in the Manufacture of Iron and Steel in the United States," which he contributed to the report of the United States Geological Survey on the Mineral Resources of this country. Although many of the figures have appeared from time to time in the *Railroad Gazette*, some of them are tabulated below.

In these tables gross tons are used for the United States and the United Kingdom, and metric tons for other countries.

The production of coal for the years named has been as below:

	1889.	1890.	1891.	1892.
U. S.	126,097,779	140,882,729	150,565,954	.....
U. K.	176,916,724	181,614,288	185,476,126	181,786,871
Germany	84,973,230	89,290,834	94,252,278	.....
France	.....	26,083,118	26,024,893	26,548,860
Belgium	.....	20,365,930	19,675,644	19,591,908

PRODUCTION OF PIG IRON.

	1890.	1891.	1892.
U. S.	9,202,703	8,279,870	9,157,000
U. K.	7,904,214	7,406,064	6,616,890
Germany	4,658,451	4,641,217	4,793,003
France	1,962,196	1,897,387	2,022,989
Belgium	787,836	684,126	768,321

PRODUCTION OF STEEL OF ALL KINDS.

	1890.	1891.	1892.
U. S.	4,277,071	3,904,240	4,927,581
U. K.	3,679,043	3,256,543	.....
Germany	2,161,821	2,352,074	.....
France	717,975	840,221	814,977

PRODUCTION OF BESSEMER STEEL INGOTS.

	1890.	1891.	1892.
U. S.	3,688,871	3,247,417	4,168,435
U. K.	2,014,843	1,642,005	1,500,810

PRODUCTION OF BESSEMER RAILS.

	1890.	1891.	1892.
U. S.	1,867,837	1,293,053	1,537,588
U. K.	1,019,606	662,676	535,816

PRODUCTION OF OPEN HEARTH STEEL.

	1890	1891.	1892.
U. S.	513,231	579,753	869,889
U. K.	1,564,200	1,514,538	1,418,830

Open hearth steel is about the only weak spot in our production, and we shall be behind the United Kingdom in this until we build more ships, but while in 1890 our production was only 24.7 per cent. of the total make of the two countries, last year it was nearly 34 per cent. of the joint production. In 1886, when the building of our new navy began, the production of open hearth steel was only 218,973 tons, and the increased production has amounted to nearly 20% per cent. The English government, however, gave out large contracts for war vessels and the trade has been further stimulated by an unprecedented commercial demand for ships, so that the United Kingdom increased its production from 694,150 tons to 1,418,830 tons, or nearly 105 per cent.; and the two countries have increased their production in the seven years by 1,175,593 gross tons. As Secretary of the Navy Herbert has pointed out, the price of the materials entering into the construction of ships, mostly open hearth steel, has fallen during this period to about one-half of its former cost, and it may be noted the cost of steel bridge and elevated railroad work has fallen from about eight cents to less than four cents per pound! The price of ship plates, etc., in England has fallen nearly as much as here.

The stocks of pig iron on hand and the approximate consumption are given as below:

	1889.	1890.	1891.	1892.
Domestic production	7,603,612	9,202,703	8,279,870	9,157,000
Imported	148,759	134,955	67,179	70,125
Stock on hand July 1	300,144	283,879	661,858	627,233
Total supply	8,052,515	9,621,537	9,008,907	9,854,358
Less stock, December 31	283,879	661,858	627,233	535,616
Approximate consumption	7,768,666	8,959,679	8,381,674	9,318,742

Of the pig iron produced last year 48.5 per cent. was classed as Bessemer pig. In 1890 44.4 per cent. was Bessemer, and in 1887, the first year in which Bessemer pig was separated, 44.8 per cent. of the total was so classed.

The production of iron and steel structural shapes is given for 1892, for the first time, as 453,957 tons; and iron and steel plates and sheets are credited with 751,460 tons, an increase of 72,533 tons. The production of wire rods, mostly steel, was for last year 627,829 tons, an increase of 91,222 tons as compared with 1891. Attention is called to the fact that our production of wire rods for last year was greater than our make of Bessemer steel rails in 1879, and almost two-thirds as many tons as of Bessemer steel rails made in either 1884 or 1885. It is probable that rather more than one-third of these wire rods went into wire nails, the production of which, 4,719,524 kegs, for the first time exceeded the output of cut nails, which was 4,507,819 kegs, all of 100 lbs. each. The production of cut nails is given year by year in the appendix for 1872, when it was 4,065,322 kegs, reaching its maximum production, 8,160,973 kegs, in 1886. Wire nails, which did not come into prominence until 1883 or 1884, have gained continuously and rapidly since 1886, when only about 600,000 kegs were made by 27 works. The product of 1892 was turned out by 39 works.

The production of iron blooms and billets from the ore has declined to 2,182 tons for 1892, and for pig and scrap the product offered for sale was only 6,922 tons.

Our iron and steel shipbuilding for the fiscal year amounted to 51,374.27 tons, gross measurement, not counting vessels built for government; of this 28,458.8 tons, or over 55 per cent., were built on the great lakes.

TECHNICAL.

Manufacturing and Business.

The large contract for sheet copper for roofing and cornices on the Pennsylvania Railroad's new trainsheds at the Broad Street Station, Philadelphia, has been awarded to Randolph & Clowes, of Waterbury, Conn. The roof alone takes 125,000 lbs. of cold-rolled sheet copper.

The Browne & Sharpe Manufacturing Co., of Providence, R. I., has contracted with Norcross Bros., of Worcester, Mass., for a new addition, to consist of a four-story brick building of fireproof construction, 163 × 51 ft., with two wings 57 × 84 ft. The boiler stack is 125 ft. high. The building has a total floor space of about 50,000 sq. ft. and will be used for the manufacture of machine tools.

The Colorado Fuel & Iron Company is adding buildings to its Bessemer steel works to extend the foundry and machine shops so as to include the making of structural iron and steel work for bridges and buildings. The iron pipe foundry is running at full capacity.

The Cleveland Bridge Co., Cleveland, O., has been granted a charter in Ohio, with a nominal capital stock. The new concern will engage in the construction of bridges and other structures, and will do a general constructing business.

The Toledo Bridge Co., of Toledo, O, is putting up an additional building 90 × 250 ft., which will be equipped for turning out all kinds of heavy iron building material. Heretofore the company have confined themselves to bridgework alone.

John A. Potter, formerly Superintendent of the Homestead Steel Works, Homestead, Pa., has recently been appointed Mechanical Engineer of the Pennsylvania Steel Co.

The New York office of the Union Switch & Signal Co. has been removed from the Times Building to the Havemeyer Building, 26 Cortlandt street.

The Drexel Railway Supply Co. has removed from its location on the ground floor of the Rookery Building, Chicago, taking more commodious quarters on the seventh floor of the Rookery.

The Greenleaf Co. is erecting a turntable for the Vandalia line at Terre Haute, Ind., which is the largest yet made by that company. It has a capacity of 150 tons, and had to be adapted to an old pit with a depth of only 4 ft. 5 in. from the top of the centre stone to the base of rail. The centre foundation was strengthened to three times its original capacity without changing the dimensions or disturbing the drainage or buildings.

At a meeting of the directors of the Jones Vestibule Sleeping Car Co., at Denver, Col., recently, the following were elected officers for the ensuing year: H. A. W.

Tabor, President; H. M. Jones, Vice-President and General Manager; W. E. Finch, Secretary; L. F. Kimball, Treasurer, and Geo. S. Hodges, General Counsel.

The Thacher Car & Construction Co. has removed its office to 947 Monadnock Block, Chicago.

The Barker Mine-Car & Foundry Co., of Springfield, Ill., has been incorporated by John H. Black, J. L. Cook and others with a capital stock of $25,000.

The Industrial Works of Bay City, Mich., has secured an order from the Carnegie Steel Co., Limited, for a 10 ton locomotive derrick to be used by the Keystone Bridge Works.

The Columbus Bridge Co., Columbus, O., was placed in the bands of a receiver May 5. The proceedings to secure the appointment of a receiver were brought by the Columbus Rubber Co.

The Weaver-Getz Car Co., of Chicago, has been organized.

The Young Lock Nut Co. has recently been organized to manufacture the Young lock nut. C. P. Treat is President, and Robert Hazlett is Secretary and Treasurer of the new company. The principal office remains at 150 Broadway, New York City.

The Mozier Safety Signal Company has finished equipping the stations of the Chicago & Erie with the Mozier semaphore and safety apparatus, and the block system is to be put in use on that road next Sunday. The Mozier company has received an order to erect its semaphores at 26 stations on the Chicago, Rock Island & Pacific.

Iron and Steel.

A reorganization committee, of which President Roberts, of the Pennsylvania Railroad, is a member, has been appointed by the Pennsylvania Steel Co. stockholders, and will submit a plan in a few weeks.

The Joliet Rolling Mill, of the Illinois Steel Co., is closed in all departments. The plant has furnished work for 2,500 men. In December a part of the mill was closed, leaving 1,000 men idle, but they then had expectations of a speedy resumption.

Highway Crossing Bells.

The highway crossing bell business of the Hall Signal Company for the month of April amounted to over $18,000.

Interlocking at Somerville, Mass.

The Johnson Railroad Signal Company has just taken a contract to put in interlocking switches and signals at Somerville Junction, about two miles from the Boston terminus, recently illustrated in the *Railroad Gazette*. This point is the junction of the Eastern and Western divisions of the Boston & Maine and the crossing by the Boston & Maine of the Grand Junction branch of the Boston & Albany. The interlocking machine will have 75 levers and 5 spare spaces. There will be 36 levers to operate switches, and 19 levers to operate switches and locks together. There are 26 facing point locks, 47 signals and 4 pot signals.

New Ore Dock Facilities on Lake Superior.

The work of constructing the ore docks of the Duluth, Messabe & Northern at Duluth, is being pushed with crews working in day and night shifts. There was considerable delay caused by the scarcity of long dimension white pine in the Northwest. In order that the completion of the dock might not be delayed until late in the season, the railroad company bought between two and three million feet of long Washington and Oregon fir, and this will tide the work along until the local mills begin sawing pine. The dock proper is 2,304 ft. long, and will contain 384 pockets, each of 175 tons capacity. The approach is 4,000 ft. in length, all but 763 ft., which is steel, crossing highways and railroad rights of way, is of pile and frame trestle construction. There will be used in the dock proper 8,000 piles averaging 48 ft. in length, and upward of nine million feet of dimension lumber. In the approach 2,300 piles and nearly two million feet of dimension timber will be used. The railroad company is building the dock. C. H. Martz is Chief Engineer and G. J. Anderson Superintendent of Construction. The dock will be equipped with the Denton counterbalanced hoist for raising and lowering the ore chutes. The Youngstown Bridge Co. has the contract for the steel spans in the approach and R. & D. Sang for the timber portion.

The extension of the No. 4 dock of the Duluth & Iron range at Two Harbors, Minn., has been completed and is now receiving ore. This work was finished on May 1, on time, by Winston Bros. & Dare, contractors. The new No. 3 dock will be completed in about two weeks. The total increase in the capacity of the docks will be 30,000 tons. All the new pockets of the docks are equipped with the Denton counterbalanced hoist.

The extension of the ore docks of the Duluth & Winnipeg at Allouez Bay, Superior, is being pushed by D. W. & Samuel Grant, contractors. Their contract calls for 44 pockets of 185 tons each and the driving of the piling for 40 pockets more.

A Russian Compound Locomotive.

A four-cylinder compound locomotive was recently put in service on the Russian Southwestern Railroad. The cylinders are outside, arranged tandem fashion, and are at a slight angle to the horizontal. The high-pressure cylinders are in front, and the design is such that the high-pressure cylinder on one side of the locomotive exhausts into the low-pressure cylinder on the other side, and *vice versa*. A special steam pipe to the low-pressure cylinders permits supplying live steam directly to these when desired, as in starting. The valves of both high and low-pressure cylinders are worked from one rod, the Stephenson link being used. The engine, in running trim, weighs 43 tons, of which 26 tons is on the four drivers. The tender weighs, loaded, 35 tons. The heating surface amounts to about 1,316 sq. ft., and the grate surface to 20½ sq. ft. The working pressure is 165 lbs. per square inch. The high-pressure cylinders are 13.2 in., and the low-pressure cylinders 20 in. in diameter, while the length of stroke is 24 in. The driving wheels are 6.56 ft. in diameter.

THE SCRAP HEAP.

Notes.

A Philadelphia paper announces that the Pennsylvania Railroad has discontinued giving passes except to its own employés.

Freight trains have had to be laid up at various points on the Mexican Central for lack of water. The drought and famine are severe in several states.

A passenger train of the Missouri, Kansas & Texas was "held up" at Pryor Creek, I. T., on the night of May 2 and the passengers robbed of $2,000.

The Railroad Men's Building, at the Grand Central Station, New York, a luxurious clubhouse, built for the trainmen by Cornelius Vanderbilt, is to be enlarged at an expense of $80,000. Mr. Vanderbilt gives the money.

The Fort Worth (Tex.) Union Stock Yards have been bought by a syndicate of capitalists, chiefly from Chicago. The Hammonds are among the principal parties to the syndicate. The deeds indicate that the property is worth over $400,000.

The Pennsylvania has discharged large numbers of men from the freight house at Pittsburgh and from the freight department at various points on the road. A Philadelphia paper estimates that 500 men have been discharged on the Peunsylvania Railroad division. The Chicago, Burlington & Quincy has discharged men from the shops at Aurora and elsewhere. It is stated that about one-fifth of the force will be taken off. The Central of Georgia has discharged men from its shops at Augusta, and it is said that forces will be reduced at other places. All the foregoing are reported as "the usual spring reductions." The yard men of the Pennsylvania at Columbus, O., struck last week, over 200 men leaving, according to one report. The grievance of these strikers is not reported with any definiteness. On Saturday it was said that the company had secured enough new men to move business satisfactorily. About 100 freight handlers in the Grand Trunk station at Montreal struck on May 6, and on May 9 it was said that the strike was spreading. There was considerable delay to freight.

Lake and Canal Matters.

Up to about a month ago everything looked as if the lake freighters would have a very prosperous season, but now affairs are worse than for several years. Wheat, Chicago to Buffalo, is down to 1 to 1⅛ cents, and ore from Escanaba to Lake Erie ports is down to 50 cents. Since the first of the month vessel-owners have been talking of discharging their crews, and several vessels have tied up The ice in front of Duluth still shuts that harbor, and the predicted coal famine is now an actual fact. The down-bound grain fleet, loaded with some 70,000 bushels of wheat and flax, is having a hard time to get fuel, while the three steamers that will go to the World's Fair are in sore need of coal for the trip. The white whale back, "Christopher Columbus," is all ready to leave. There are said to be no less than 70 vessels now on the way with coal alone, while the fleet in ballast is probably much larger. But in spite of all this, coal from Buffalo to Duluth was cut to 30 cents per ton. Bayfield is now open and a steamer worked through the ice into Marquette on the 7th.

On the Erie Canal, which opened on the 3d instant, traffic opens at higher prices. Boats are in demand at 5 cents for wheat and 4⅝ cents for corn, to New York. This is one of the best openings for canallers in years. The lake freighters claim that there is a great disproportion between one cent on the lakes and five cents on the canal and call for a reduction of canal rates that will allow a vigorous fight against the cut in freight rates made by the railroads.

The discrimination against American vessels and those that transfer cargoes at Ogdensburg, heretofore enforced on Canadian canals, has been removed and a uniform rate of 10 cents per ton has been established. The President has not yet issued the proclamation establishing reciprocity in wrecking on the lakes, but Senator McMillan and various lake interests are urging it.

A steamer 254 ft. long and 40 ft. beam, with a carrying capacity of 2,700 tons, has been launched on the Tyne for Canadian use on the lakes.

Consolidation of Coal Interests in West Virginia.

At a meeting held in Baltimore last Saturday, the final arrangements for the consolidation of the coal companies in which Hon. Henry G. Davis and Hon. Stephen B. Elkins are the chief stockholders were made. The new company is known as the Davis Coal & Coke Co., and it will include all the companies operating along the West Virginia Central & Pittsburgh Railroad. The new concern is capitalized at $3,000,000, and includes the plants of the H. G. Davis Coal & Coke Co., the Davis Coal & Coke Co., the Davis-Elkins Coal & Coke Co., the Henry Coal & Coke Co. and the Fairfax Coal & Coke Co. The mines are all located in the counties of Mineral, Tucker, Grant and Randolph, W. Va., and carry with them 50,000 acres of coal, embracing all the common grades of bituminous, steam, cooking, gas and smithing. The headquarters of the new concern will be in New York. The officers of the company are: Stephen B. Elkins, President; Thomas B. Davis, Vice-President; F. B. Lott, Secretary and Treasurer, and Fairfax S. P. Landstreet, General Manager. Under this combination, all the coal mined along the line of the West Virginia Central & Pittsburgh road will be marketed under one management. The object of the consolidation is to save expenses of management and distribution of the product of the several concerns, which were all practically under one ownership before. With the completion of the West Virginia Central & Pittsburgh's line to the east (the road is controlled by about the same capital as is represented in the new coal company) a new and very strong competitor will appear in the soft coal markets of the East.

Bids for New York Terminus of the Brooklyn Bridge.

The trustees of the Brooklyn Suspension Bridge opened bids last week for building the enlarged New York station of the bridge. Three bids for the work were submitted. The bid of Levering & Garrigues, of New York, was $247,629; of Milliken Bros., of New York, $265,643, and of the Phœnix Bridge Co., $259,887. The contract was let to Levering & Garrigues, the lowest bidders. L. W. Seaman made a bid of $103,719 for the carpenter work, and was awarded that contract. The following were the principal items in the bids on the metal work for the station:

TITLE.	Quantities	Levering & Garrigues.		Milliken Bros.		Phœnix Bridge Co.	
	Lbs.	@	Total.	@	Total	@	Total.
Riveted girders.....steel	582,300	3 4/10	$19,798.20	4.025	$23,437.58	3.63	$21,137.49
Latticed girders..... "	171,100	3 8/10	6,159.60	4.485	7,673.84	3.63	6,210.93
Roof trusses..... "	371,600	3 8/10	14,120.80	4.37	16,238.92	4.18	15,532.88
Outer stairway stringers..... "	28,300	6	1,698.00	4.37	1,236.71	5.13	1,451.79
Columns and struts..... "	161,500	4 4/10	7,267.50	4.485	7,243 28	3.83	6,185.45
Rolled beams and channels..... "	431,000	2 9/10	12,499.00	3.45	14,869 50	2.98	12,843.80
Purlins..... "	246,300	3 8/10	9,605.70	4.43	10,911.09	4.18	10,295.34
Angle braces, plates, etc..... "	150,000	4	6,000 00	4.45	6,675.00	4.18	6.270.00
Arch ties and wind brace rods.....wrought iron	43,000	4	1,720.00	4 5	1,935.00	4.28	1,840.40
Wind brace struts..... " "	30,000	5	1,500.00	4.7	1.410.00	4.03	1,209.00
Gutters, moldings, risers, etc.....cast iron	464,000	7½	34,800.00	7.7	35,728.00	7.6	35,264.00

The improvements to be made at the New York teminus were described April 28.

The Pullman-St. Paul Suit.

The United States Circuit Court of Appeals has reversed the decision of Judge Gresham and dissolved the injunction granted by him at the instance of the Chicago, Milwaukee & St. Paul road, restraining the Pullman Company from prosecuting its action to recover damages from the St. Paul for breach of contract pending an accounting which the St. Paul claimed would show that the Pullman Company was indebted to the road on the contract which was terminated some 18 months ago. The opinion states that the order restraining the prosecution of the suit at law was improvidently granted and that the principle upon which the intervention of equity is sought are not applicable to the case. The railroad company, during a period of eight years, the opinion goes on to say, was furnished monthly statements of the expenses and receipts attending the operation of the cars. It was paid monthly the amount thereby shown to be due. There was no objection to the accounts until the contract had been terminated by its election and it was called upon to pay the value of the interest of the Pullman Company in the cars of which the road desired to become sole owner. It remained inactive for some months after it had appropriated the cars and until suit at law had been brought by the Pullman Company to recover the value of its interest. In its equitable action it does not attack the claim or assert any equity against its enforcement, but simply insists that it may retain possession of the cars and use and operate them without paying the Pullman Company therefor while it is investigating accounts. The court says it is not impressed with the equity of this claim and can find no ground upon which to sustain it.

The Style of a Trunk Does Not Indicate Its Contents.

The Supreme Court of the United States has decided a case which settles one more point of the law about the liability of railroads for trunks containing articles other than personal effects. A traveling salesman for a jewelry house checked a trunk valued at $7,000 and lost it in a wreck. The Illinois Circuit Court decided against the corporation for full value, on the ground that the baggage agent from the appearance of the trunk must have known that it contained other things besides clothing. The Supreme Court sweeps all this reasoning away and holds that the carrier's liability was only for personal baggage, and that the value of the jewelry could not be recovered from it.

Safety of Passengers on the Fall Brook Railway.

A local paper prints a statement that during the 20 years just past not one passenger has been killed on the above named road, and only six passengers have been injured; and in two of those cases the injury was the result of the carelessness or misconduct of the passenger himself. During the 11 years preceding, from 1862 to 1872 both inclusive, no reports of passengers carried are available, but during that period no passengers were killed or injured, so that the company can present the remarkable record to the public that during the past 30 years no passengers were killed and only six have suffered injury. During the 20 years just past 5,160,834 passengers have been carried, and during the entire period of 30 years the number would easily reach 6,000,000. Up to 1873 there were 53 miles of road; from that time up to 1878 there were 83 miles of road; from that time until 1883 there were about 165 miles of road, and from 1883 to the present time the length of main line and branches operated has been about 250 miles.

Safety on railroads is due to a great many factors combined, each highly important in itself; but it should not pass without notice that this road is one whose excel

lent discipline we have had occasion to speak of now and then; and some of the specimens of good management that we have spoken of without naming the road were observed on this line.

Got Thirty Days' Leave.

This is the heading of an item in a Denver paper telling how an entire train crew of the Union Pacific has been disciplined for engaging in a seductive game of poker. "The crew ran on the Colorado Central, running up to Silver Plume and back the same day. A few days ago the conductor, engineer, fireman and brakeman sat down to a game of poker while awaiting the time to start on the return trip. In the excitement of the game the minutes flew swiftly by and the conductor awoke to his responsibility to find that fifteen minutes of running time had been lost. Superintendent McCormick gave the men a vacation of 30 days apiece."

This reminds us of a story told about one of our Eastern roads not long ago, which we believe has not appeared in print. It was not a "snide" road, either; but one of those whose name is oftenest seen in the daily newspapers; and the oversight was dangerous, instead of harmless as in this Colorado case.

A freight train running on single track approached a station where it should enter upon the double track, to continue its journey, and the switch was wrong, being set so as to let the train into the track on which a passenger train was due to come from the opposite direction. The engineer and the fireman of the freight both failed to look at the switch, and not only ran over it, but proceeded a mile or two on the main track without discovering their error. The train was finally stopped, however, just before it met the passenger train. And now for the cause of this remarkable oversight. It was simply a circular from the New Orleans lottery, in which both the engineer and the fireman were interested, and which they were obliged to spread out on the floor of the cab in order to conveniently read the vital information it contained. It looks as though "railroad gambling" were not all carried on in Wall street.

Shipments from the Mesaabi Range.

A little over a year ago the Mesaabi Iron Range in Minnesota was an unknown quantity. During the past year remarkable development has been made, and the output is ready for shipment as soon as lake navigation is open. Two railroads have been built to this new iron field, and the dock facilities have been and are now being largely added to for handling the product of the mines. The following figures show how great are the preparations for handling Mesaba ore:

	Tons.
Duluth, Messabe & Northern dock, St. Louis Bay, new.	67,200
Duluth & Winnipeg dock, Allouez Bay, extension	8,480
Duluth & Iron Range dock, Two Harbors extension and new	30,000
Total increase	105,680

New American Cars in Germany.

A new vestibuled American train has been put in service between Bremen and Bremerhaven, Germany, a distance of 30 miles. It consists of five first class and five second class coaches. All are built on the American plan. A new express train has also been added to the four already in service between Bremen and Berlin.

Second Class in England.

Second class travel from London to Scotland ceased on May 1, on which day the East Coast and West Coast routes stopped selling tickets at second-class rates. The third route to Scotland by the Midland and Glasgow & Southwestern gave up the second class 18 years ago. In fact, the second class has been absorbed into the third, which has gradually become about equal to the second in point of comfort. This step does away with a considerable amount of dead weight to be hauled and simplifies the matter of providing accommodation for various sorts of travelers, such as smokers, non-smokers and ladies. Both of these lines, the East Coast and the West Coast, are building third-class dining cars for their Scotch business and have used cars with corridors and lavatories for some time. For the present, at least, the third class continues to be called the third class and there is no second.

The Elizabeth Elevated Completed.

The last Pennsylvania train through Elizabeth, N. J., on the old grade, passed through the city on Monday morning, and on that day a Washington express made the first westbound trip over the elevated structure. All trains are now using the elevated road, and the dangerous grade crossing of the Pennsylvania and the Central of New Jersey at the Broad street-Morris avenue crossing is now abolished. During the week the foundation between the tracks of the Central of New Jersey has been extended the full width of the two tracks now elevated, the last girder placed, and the floor-beams and track laid over the girder bridge that spans the central tracks, and is part of the permanent structure. The westbound platform has been built along the west side of the trestle at the Broad street station, flights of easy stairs have been erected to furnish access to the platform from the ground and a fence has been built along the platform between the two tracks. The present grade tracks will be left down except at the crossing to facilitate the filling in of the trestle.

LOCOMOTIVE BUILDING.

The Vandalia line has recently received from the Pittsburgh Locomotive Works, three ten-wheel engines, cylinders 19×26, drivers 72 in. diameter; weight 67½ tons. One of these is shown at the World's Fair.

The Cooke Locomotive & Machine Co., of Paterson, N. J., is building for the Southern Pacific Co. 14 ten-wheel engines for passenger service, with cylinders 19×24 in.; six driving wheels, 63 in. diameter; four-wheeled leading truck with Krupp wheels; firebox of the long, wide, shallow type, placed on frames. These engines are to be equipped with all of the modern improvements, such as Westinghouse-American brakes, I-section side rod, firebrick arch, Jerome metallic packing, Nathan lubricator, etc. The tender has a capacity of 4,000 gallons of water; engine in working order, weight, 132,000 lbs., of which 100,000 lbs. are on the drivers. The tender weighs 80,000 lbs. loaded. These are all simple expansion engines. The company is also having three compound locomotives built by the Schenectady Works, and eight six-wheeled switchers are being built for the company at the same works.

CAR BUILDING.

The Manhattan Elevated Road is asking bids for building 75 standard passenger cars, the delivery to begin in September.

Ten of the first cars manufactured by the American Car Company, at Basic City, Va., left the shops last week. These are part of an order for 300 cars for the Chesapeake & Ohio.

The St. Charles Car Company is now delivering to the Wabash Railroad the equipment for the new daily vestibuled trains to run between St. Louis and Chicago. These cars were ordered last fall, and each vestibuled train will consist of parlor car, chair car, café car and day passenger car.

BRIDGE BUILDING.

Amsterdam, N. Y.—A bill appropriating $4,500 for a canal bridge at Bridge street, Amsterdam, has become a law.

Bloomsburg, Pa.—The Grand Jury for Columbia has reported favorably on a free county bridge over the Susquehanna River at Bloomsburg, to connect with the Pennsylvania Railroad at Bloomsburg Ferry.

Cumberland, Md.—The County Commissioners of Allegany County, Md., last week let the contracts for building 12 iron bridges to the Vulcan Road Machine & Bridge Co., of Charlestown, W. Va. The bridges are all small ones, to be erected over small streams in Allegany County. Two of them will be across Evitt's Creek, two over Murley's Branch, one at Barrelsville, one at Mount Savage, four over Jennings' Run, one over Trotter's run and one over The Creek. Wooden bridges were considered for these points, but the county engineer and a majority of the commissioners were in favor of spanning the small streams with steel or iron bridges.

New York City.—Bids for constructing and erecting the four-track elevated viaduct from 110th Street to the Harlem River on Park Avenue were opened by the Park Improvement Commissioners last week. The conditions of the bids were that bids should be for four sections. These sections are approximately 1,873 ft., 1,570 ft., 1,083 ft., and 1,753 ft. The estimated totals of material are: Columns, 1,308 tons; girders, 5,745 tons; bracing, 271 tons; floor system, 10,244 tons; wheel guards, 95 tons. Besides these are drainage pipes, gutters, railings, etc.

There were three bidders only. Their offers were as follows:

	First section.	Second section.	Third section.	Fourth section.
Elmira Bridge Co.	$373,000	$344,000	$379,000	$424,000
King Bridge Co.	464,756	397,546	424,119	510,426
New Jersey Steel & Iron Co.	357,000	311,300	333,000	.....

The Elmira Bridge Company bid for any one section of the whole of the work, and it was understood that the King Bridge Company did the same. The New Jersey Steel & Iron Co. bid for any one of the first three sections, but not for more than one; nor did it make a bid for the fourth section.

Rome, N. Y.—The bill appropriating $2,500 for the construction of a canal bridge at South James street, Rome, has become a law.

Utica, N. Y.—Governor Flower has signed the bill authorizing Utica to issue $15,000 in bonds to raise moneys to be applied with a state appropriation of $30,000 for the erection of a canal bridge at Genesee street.

Vicksburg, Miss.—The business men of Vicksburg have petitioned the Board of Supervisors to build a second iron drawbridge over Big Black River at once.

Wenatchee, Wash.—The Great Northern's new cantilever bridge across the Columbia, near Wenatchee, Wash., was to be ready for crossing on May 10. The bridge, exclusive of approaches, is 916½ ft. long. The spans are 250 ft., 416½ ft. and 250 ft., respectively. It is 120 ft. above high water.

Wheeling, W. Va.—The Wrought Iron Bridge Co., of Canton, O., has commenced work on the new bridge of the Wheeling & Belmont Bridge Co., over the "Back River" between Wheeling Island and Bridgeport, O., which was described in the *Railroad Gazette* some months ago. The new bridge is being erected without interfering with traffic over the old bridge which occupies the site at present.

Will's Point Tex.—The contract has been let for the construction of an iron bridge 2,100 ft. long across Sabine River at "Deninit" crossing, between Van Zandt and Rains counties.

Woodbury, N. J.—The Board of Freeholders of Gloucester County has ordered that $4,000 be borrowed for the final payments on the new iron bridge in this city.

MEETINGS AND ANNOUNCEMENTS.

Dividends:

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago, Burlington & Quincy, quarterly, 1¼ per cent., payable June 15.

Cleveland & Pittsburgh, quarterly, 1¾ per cent., payable June 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Ashland, annual, Hudson, Wis., May 20.

Burlington, Cedar Rapids & Northern, annual, Cedar Rapids, Ia., May 23.

Cedar Falls & Northern, annual, Hudson, Wis., May 20.

Chesapeake & Ohio Southwestern, special, Memphis, Tenn., June 13, to approve of the purchase of the Hodgeneville & Elizabethtown.

Chicago Burlington & Quincy, annual, Chicago, May 17.

Chicago & Eastern Illinois, annual, Chicago, June 7.

Chicago & Northwestern, annual, Chicago, Ill., June 1.

Chicago, St. Paul, Minneapolis & Omaha, annual, Hudson, Wis., June 3.

Compton Heights, Union Depot & Merchants' Terminal, annual, St. Louis, Mo., May 31.

Delaware & New England, annual, Wilmington, Del., May 15.

Des Moines & Fort Dodge, annual, Des Moines, Ia., June 1.

Duluth & Winnipeg, special, Duluth, Minn., May 18.

Eau Claire, annual, Hudson, Wis., May 20.

Flint & Pere Marquette, annual, Saginaw, Mich., May 17.

Menominee, annual, Hudson, Wis., May 20.

Milwaukee, Lake Shore & Western, annual, Milwaukee, Wis., June 2.

Minneapolis, St. Paul & Sault Ste. Marie, annual, Minneapolis, Minn., June 6.

Missouri, Kansas & Texas, annual, Parsons, Kan., May 17.

Mobile & Girard, special, Girard, Ala., June 7.

Mobile & Ohio, special, Mobile, Ala., May 29.

Nealsville & Northeastern, annual, Hudson, Wis., May 20.

New York & Harlem, annual, New York City, May 16.

Omaha & St. Louis, annual, Stanberry, Mo., May 16.

Peoria, Decatur & Evansville, special, Peoria, Ill., June 30.

Pittsburgh, Fort Wayne & Chicago, annual, Pittsburgh, Pa., May 17.

St. Louis, Alton & Terre Haute, annual, St. Louis, Mo., June 5.

St. Louis & Hannibal, special, New York City, May 26, to vote upon the purchase of the St. Louis, Hannibal & Kansas City.

Sault Ste. Marie & Southwestern, annual, Hudson Wis., May 20.

Superior Short Line, annual, Hudson, Wis., May 20.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *International Association of Car Accountants* will hold its next annual convention at Indianapolis, June 19.

The *Master Mechanics' Association* will hold its annual convention at the Kent House, Lakewood, N. Y., commencing June 19.

The *Master Car Builders' Association* will hold its annual convention at the Kent House, Lakewood, N. Y., commencing June 13.

The *Association of American Railway Accounting Officers* will hold its fifth annual meeting at the Auditorium Hotel, Chicago, commencing May 31.

The *Railway Agents' Association of North America* will meet at Old Point Comfort, Va., on Tuesday, May 16.

The *National Association of Car Service Managers* will hold its annual meeting at Chicago, May 23.

The *Train Dispatchers' Association of America* will hold its annual convention in Salt Lake City, Utah, June 20.

The *World's Railway Commerce Congress* in connection with the World's Fair at Chicago will hold a meeting at Chicago, June 19.

The *Association of Railway Telegraph Superintendents* will hold a meeting at Milwaukee, Wis., June 20.

The *Western Railway Club* meets at the rooms of the Central Traffic Association in the Rookery Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 7.30 p. m.

The *Northwest Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month except during June, July and August, at 8 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, Bromfield street, Boston, on the third Wednesday in each month, at 7.30 p. m.

The *Western Society of Engineers* meets at 78 La Salle street, Chicago, on the first Wednesday in each month, at 8 p. m.

The *Engineers' Club of St. Louis* meets in the Odd Fellows' Building, corner Ninth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Engineers' Society of Western Pennsylvania* meets at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa., on the third Tuesday in each month, at 7.30 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month at 8 p. m.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The Denver Society of Civil Engineers meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday except during the months of June, July, August and September.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Tacoma Society of Civil Engineers and Architects* meets in its rooms, 201 Washington Building, Tacoma, Wash., on the third Friday in each month.

The Association of Engineers of Virginia holds informal meetings the third Wednesday of each month, from Septemcer to May inclusive, at 719 Terry Building, Roanoke, at 8 p. m.

Car Inspectors' Protective Association of North America.

This organization held its third annual convention in Pittsburgh last week. The officers for the ensuing year are: Supreme Chief Inspector, L. G. Ernst, New Orleans; Secretary, Henry Schlobohm, Pittsburgh. The next meeting will be at Atlanta in May, 1894.

The Civil Engineers' Society of St. Paul.

A regular meeting of the Civil Engineers' Society of St. Paul was held May 1. Messrs. R. B. C. Bement and Lewis W. Clarke were elected to membership. Mr. E. E. Woodman addressed the society on the "Geology of the Lake Superior Iron Regions." The meetings are adjourned to Oct. 2, 1893.

M. C. B. Convention.

The members of the committee of the Master Car Builders' Association, which has in hand the arrangements for the forthcoming convention at Lakewood, N. Y., report that inquiries for accommodations are coming in slowly from the members of the Association and request that all members who desire quarters reserved for them make application at once. Both the Kent House and the Sterlingworth Inn will be devoted to the housing of the guests. All applications should be addressed to J. B. Brady, Kent House, Lakewood, N. Y.

Some confusion having arisen as to the best way of reaching Lakewood we give below the different routes: Lake Shore & Michigan Southern, or New York, Chicago & St. Louis, to Brocton; Western New York & Pennsylvania to Mayville, thence by boat to Lakewood. Or passengers may go by Western New York & Pennsylvania to Greenhurst Ferry and thence across to Lakewood. On the Erie all through trains stop at Lakewood. Passengers should avoid going to Jamestown instead of Lakewood.

Engineers' Club of Philadelphia.

A meeting was held on April 15, Vice-President James Christie in the chair, 34 members and visitors present.

Mr. Edward K. Landis read a paper on "The Development of the Tilly Foster Iron Mine," in which he gave a brief historical account of the possession and early working of the property, and a detailed description of its more recent development.

It is situated in Putnam County, New York State, about two miles west of Brewster and 52 miles north of New York City.

For the meeting on May 6 the programme included a paper on "The Grinding of Portland Cement," by Pierre Giron, and an illustrated discussion of "Engineering in Mexico," by John Birkinbine, President of the Club, who has just returned from an extensive journey in that country.

Engineers' Society of Western Pennsylvania.

The regular meeting was held April 14, Mr. Thomas H. Johnson, Vice-President, in the chair. Eleven applicants for membership were elected.

The papers of Messrs. W. G. Wilkins and G. Kaufman, on Foundations, read March 21, were discussed. The following is an abstract of Mr. Kaufman's paper:

The chimney in question was damaged by a severe windstorm and the writer was called upon to report whether it could be repaired and put in absolutely safe condition. The report was adverse to its being repaired for reasons given in this paper, and it was taken down and another built in its place.

The stack was square and built on a square brick pedestal. Total height from foundation to top 137 ft. 6 in.; top of pedestal to top of stack 125 ft. 6 in. Shaft 10 ft. square on bottom and 6 ft. 6 in. square on top. The soil on which the stack was built consisted of sand and blue clay, in which was interspersed fine gravel. The foundation consisted of a bed of concrete 30 in. thick, having imbedded therein two layers of 5 in. I beams weighing 10 lbs. to the foot, placed 3 ft. apart. On top of the concrete were placed three courses of cut stone. The foundation was stepped off on three sides; one side of the stack (southern) being placed in the same vertical lane as the southern edge of the foundation courses. This caused eccentric loading of the foundation and was one for purpose of saving room.

d An arched opening, 2 ft. 2 in. wide and 60 in. high, was left at the bottom of the stack for cleaning purposes, on the east side; and on the north side, 14 ft. up, was another 4 ft. 6 in. wide and 5 ft. 2 in. high to admit the flues.

The shaft was lined with fire brick, separated from the shaft proper by an air space. Hard burned brick laid in cement was used for the outer shaft. During building, some cracks appeared about the flue opening, and a two-inch tie rod was there inserted. When the stack was about done, a brisk wind storm from the south arose, badly shattering the bricks in the north face above and below the flue opening, and to some extent those on the east and west faces. The arch in the north face bulged outwards, causing fear that the stack would collapse through weakness at that point. Immediate danger was removed by tying the east and west faces together at that place.

The plan was revised, and by the calculations it was found that: 1. Under a wind pressure of 50 ins. per square foot the pressure on the southern edge was 5.7 tons per square foot, entirely too high for the soil. 2. At a section 77 ft. up the stack would barely stand a pressure of 40 lbs. per square foot. 3. At the springing line of the arch of the flue opening, the maximum safe wind pressure was 30 lbs. per square foot. 4. The base should have been 12 ft. 6 in. square instead of 10 ft., and the load on the foundation should have been placed concentrically. 5. Instead of 25 in. the lowest section should have been 31 in. thick.

For these reasons, and because the bond of the brickwork was destroyed, and furthermore because the firebrick lining had been tied at short intervals by means of ¼ in. plates to the outside brickwork, causing great doubt as to the stack in its shattered condition being able to withstand the strains due to the unequal expansion of firebrick and ordinary brick, a report was rendered advising that it be taken down.

PERSONAL.

—Mr. Frank C. Lewis, formerly with the King, Youngstown and Mt. Vernon Bridge companies, is now Chief Engineer of the Columbus Bridge Company, of Columbus, O.

—Mr. Theodore N. Ely, Chief of Motive Power of the Pennsylvania Railroad, has been appointed an Honorary Commissioner to the World's Fair. Mr. Ely has had prepared the Pennsylvania Railroad's extensive exhibit at the Fair.

—Mr. E. M. Burns, who has been General Manager of the Adirondack & St. Lawrence and Mohawk & Malone, has retired with the lease of these roads to the New York Central, but remains with Dr. W. Seward Webb as Manager of his Adirondack lands.

—Mr. S. G. Gaillard, formerly Assistant Engineer in the Construction Department of the Norfolk & Western, has been appointed Assistant to President Kimball, of that company. He succeeds Mr. C. H. Mellon, who becomes Assistant Treasurer of the company.

—Mr. Robert Hitchcock, for years Master Car Builder of the Connecticut River road, died at Springfield, Mass., last week, only a short time after his resignation from the railroad service. He had been connected with the Connecticut River road for 41 years, nearly all the time as Master Car Builder.

—Mr. J. J. Ryan, General Division Master Mechanic of the Southern Pacific, has had his jurisdiction extended to cover the entire Atlantic System of that road, including the ocean steamship service of the company. He was formerly in charge on the lines west of Lafayette, Tex., but has been given charge of motive power, on lines east of Lafayette also.

—Mr. William B. Doddridge, who was this week elected General Manager of the Missouri Pacific, has been for some years General Manager of the St. Louis Southwestern road. He was formerly connected with the Union Pacific as Station Agent, Division Superintendent, General Superintendent of the Idaho Division, and then Superintendent of the Central branch. He became Superintendent of the Western Division of the Missouri Pacific in 1887.

—Mr. M. D. Monserrate has been appointed Vice-President and General Manager of the San Antonio & Aransas Pass road, which is now controlled in the interest of the Southern Pacific. Mr. Monserrate has been for several years in charge of operated roads of the Southern Pacific system in Texas, his title being Vice-President and General Superintendent of the Gulf, Western Texas & Pacific and New York, Texas & Mexican roads. His successor is Mr. W. S. Hoskins, who has been General Superintendent of the Sabine & East Texas road.

—The new Railroad Commissioners of Kansas are W. D. Vincent, editor of the Clay Center *Dispatch*, a Populist paper; John Hall, a Fusion Democrat of Neosho County, and P. B. Maxson. Mr. Maxson has been in office since April 1; the other two came in on the issuance of the Supreme Court decision turning out the two former members, who had denied the power of the executive council to remove them. The case before the court seems to have been wholly confined to technical points concerning the powers of the executive council. It is said that the new Secretary of the board will be M. D. Henderson, and the clerk J. M. Senter, of Ness City. The latter was a candidate for Senator at the last election.

—The Board of Managers of the Philadelphia & Reading Railroad Co. last week accepted the resignations of Second Vice-President Charles G. Eddy, Third Vice-President Charles Hartshorne, Fourth Vice-President Robert H. Sayre and Fifth Vice-President John Russell Young. All these offices have been abolished. First Vice-President Theodore Voorhees will remain in charge of the operating department of the Reading system. Messrs. Hartshorne and Sayre became Vice-Presidents of the Philadelphia & Reading in February, 1892, at the time of the lease of the Lehigh Valley and they retain their connection with the latter company. Mr. Eddy became connected with the Reading only last February to take charge of the traffic department. He was formerly Vice-President of the Norfolk & Western for six years in charge of traffic matters.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—General Manager Frey has reorganized the system into two grand divisions—the Eastern grand division to include all lines east of Dodge City, Kan., and the Western to include all lines west of that point. The following appointments were made effective May 1: H. R. Nickerson, General Superintendent Eastern grand division, Topeka, Kan.; H. U. Mudge, General Superintendent Western grand division, Colorado Springs; T. H. Sears, Superintendent Western division, vice H. U. Mudge, promoted, with office at Pueblo; F. S. Easley, Superintendent Rio Grande division, vice T. H. Sears, transferred, with office at San Marcial: B. H. Bryant, Superintendent and Chief Engineer Colorado Midland division, Colorado Springs; C. E. Rittenhouse, Assistant Superintendent Colorado Midland division, Colorado Springs; R. C. Bowdish, Assistant Superintendent Colorado Midland division, Leadville. The jurisdiction of John Player, Superintendent of Machinery, and other general officers of the Atchison, have been extended over the Colorado Midland.

Charles S. Lee, formerly General Passenger Agent of the Colorado Midland, has been appointed by H. Collbran, the new General Agent of the Colorado Division, as Division Passenger Agent, with office in Denver. J. H. Walters has been appointed Division Freight Agent for the same territory.

Austin, Bastrop & Colorado Valley Terminal.—The first meeting of directors of this new company recently chartered was held at Bastrop, Tex., May 1, when the following officers were elected: J. W. Burke, President; H. P. Luckett, Vice-President; Chester A. Erhard, Bastrop, Secretary and Treasurer; John Andrewatha, Chief Engineer, Austin, Tex.

Brigantine Beach.—The annual meeting was held in Brigantine, N. J., May 3, and the following directors were elected: R. B. Roosevelt, S. R. Shipley, J. A. McKee, William Hacker, of Philadelphia; Moritz Lippman, George M. Van Hoesen, J. B. Van Woert, Warner Van Norden, R. B. Roosevelt, Jr., of New York; J. A. Spear, J. E. P. Abbott and H. S. Scull, of Atlantic City, N. J.

Buffalo, Rochester & Pittsburgh.—On May 8 the offices of the General Superintendent and General Car Agent were removed from Bradford, Pa., to No. 257 Washington street (Coal and Iron Exchange Building), Buffalo, N. Y. James Bruce, Trainmaster Pittsburgh Division; T. H. Kirk, Trainmaster, Rochester Division; R. G. Mathews, Trainmaster, Buffalo Division, have been appointed Superintendents of their respective divisions.

Canadian Pacific.—Sir Donald Smith, William C. Van Horne, Richard B. Angus, Montreal; Edmund B. Osler, Toronto; Sanford Fleming, C. E., Ottawa; Lieut.-Gov. George A. Kirkpatrick, Toronto; Gen. Samuel Thomas, New York; George R. Harris, Blake Bros., Boston; Richard J. Cross, of Morton, Bliss & Co., New York; Wilmot D. Matthews, Toronto; Donald MacInnes, Hamilton; Thomas Skinner, London; John W. Mackay, San Francisco; Thomas G. Shaughnessy, Montreal. Mr. Van Horne was re-elected President. Lord Mount Stephen has retired from the Board of Directors.

Central of New Jersey.—J. G. Thomas, Assistant Superintendent of Motive Power and Equipment, succeeds the late L. C. Brastow as Superintendent of the shops on the Lehigh & Susquehanna Division, with headquarters at Ashley, Pa. W. L. Hoffecker succeeds Mr. Thomas as Assistant Superintendent of Motive Power and Equipment in charge of all shops on the Jersey Central Division, with headquarters at Elizabeth, N. J.

At the annual meeting held in Jersey City, N. J., May 5, the following Board of Directors was re-elected: Edward D. Adams, George F. Baker, Harris C. Fahnestock, James A. Garland, Henry Graves, Charles Lanier, Henry W. Maxwell, J. Rogers Maxwell and Samuel Sloan.

Central Vermont.—A. W. Ecclestone has been appointed Southern Passenger Agent of this company, with office at 353 Broadway, New York City, vice W. R. Babcock, resigned to accept position with another company.

Chicago, Fort Madison & Des Moines.—E. F. Potter, Superintendent of the road, has tendered his resignation and will be succeeded by J. C. Mackinnon, General Passenger and Freight Agent.

Chicago & Northwestern.—P. Hallenbeck has been appointed Superintendent of the Iowa Division, with headquarters at Boone, Ia., vice M. Hopkins.

Cincinnati & Muskingum Valley.—C. M. Bennett has been appointed Superintendent of this company, with office at Zanesville, O., vice C. H. Walton, resigned.

Clay City & Saylor Springs.—The stockholders of the company met at Clay City, Ill., May 6, and elected Lilburn G. McNair and John G. McNair, of St. Louis; Myles Dorsey, J. I. McCowley and N. M. Burns, of Clay City, as the first Board of Directors. The board organized by electing J. I. McCowley President, L. G. McNair Vice-President and Treasurer, and M. Burns Secretary and General Manager.

Dover & Statesboro.—Judge Speer, of the United States Court, has appointed J. W. Cabaniss, of Macon, permanent Receiver of this Georgia railroad. He will relieve Marion Erwin, who was given temporary charge of the road.

Eastern of New Hampshire.—The annual meeting was held in Portsmouth, N. H., at which the following directors were elected: Dexter Richards, E. A. Giddings, W. H. Goodwin, F. A. Philbrick and S. C. Eastman. The officers elected were: Moody Currier, President; E. A. Abbott, Treasurer, and John Sise, Clerk.

East St. Louis Connecting.—D. McMurray has been appointed Master Mechanic of this road, with headquarters at East St. Louis, Ill.

Findlay, Fort Wayne & Western.—O. H. Odell has been appointed General Freight and Passenger Agent, vice Wilbur Rogers, resigned.

Great Northwest Central.—The adjourned special meeting of the shareholders was held at Ottawa, Ont., May 2, when the following officers were elected: J. B. Delap, President; J. A. Gemmill, Vice-President, and M. O. A. Howland, Secretary.

Illinois Central.—J. S. Chambers has been appointed Master Mechanic of the Amboy district of the Illinois Central. Mr. Chambers has been for several years Master Mechanic in charge of the St. Joseph's Terminal Company's rolling stock at St. Joseph, Mo.

Kinderhook & Hudson.—At the annual meeting of the railroad held in Watertown last week, J. V. Clarke was elected President, Joseph Mullin, Vice-President, and John R. Pawling, Secretary.

Lake Shore & Michigan Southern.—At the annual meeting held in Cleveland, O., May 3, the following directors were re-elected to serve for a term of three years: Cornelius Vanderbilt and Darius O. Mills, New York; James H. Reed, Pittsburgh, and Rasselas Brown, Warren, Pa.

H. J. Merrick has been appointed Car Accountant, vice C. E. Wheeler, resigned.

Mexican Central.—At the annual meeting held in Boston, Mass., Warren Sawyer retired from the board of directors, and A. A. Robinson was elected to fill the vacancy. Mr. Robinson was recently elected President.

Mexico, Cuernavaca & Pacific.—J. E. Earley has been appointed Consulting Engineer; M. H. Munson, in charge of construction, and Charles Kirschhoff, chief of location, all with offices in the City of Mexico.

Michigan Central.—The stockholders held their annual meeting at Detroit, on May 4. The following were re-elected directors for the ensuing year: Cornelius Vanderbilt, William K. Vanderbilt, Frederick W. Vanderbilt, Edwin D. Worcester, Samuel F. Barger and Chauncey M. Depew, of New York; Henry B. Ledyard and Ashley Pond, of Detroit; Frederick S. Winston, of Chicago.

Missouri Pacific.—At a meeting of the Board of Directors of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, held May 9, George J. Gould was elected President of both companies and W. B. Doddridge, General Manager.

Morrtstown & Cumberland Gap.—Jackson Smith, Receiver, has made the following appointments: W. G. Lacy, Superintendent, and C. E. Seaton, Superintendent of Machinery, with offices at Morristown, Tenn.

New York Central & Hudson River.—The following appointments have been made to take effect from May 1: Marshal L. Bacon to be Assistant Comptroller; Richard A. White to be Auditor of Disbursements; Charles H. Chambers to be First Assistant Auditor of Disbursements, and William W. Anstey to be Second Assistant Auditor of Disbursements.

This company having leased and assumed the control and management of the Mohawk & Malone and Carthage & Adirondack roads, those roads have been made a Fifth Freight Division. H. D. Carter has been appointed Division Freight Agent of the new Division, with office at Herkimer, N. Y., and is also appointed "General Agent" of the Passenger Department, in direct charge of passenger traffic on the new Division.

New York, Chicago & St. Louis.—The annual meeting of the company was held in Cleveland, O., May 3, at which the old board of directors was re elected, as follows: William K. Vanderbilt, Cornelius Vanderbilt, Frederick W. Vanderbilt, Hamilton McK. Twombly, John S. Kennedy, James A. Roosevelt, F. P. Olcott and Chauncey M. Depew, of New York; Allyn Cox, Yonkers, N. Y.; Charles M. Reed, Erie, Pa., and D. W. Caldwell, Ralph W. Hickox and Samuel E. Williamson, of Cleveland.

New York, Lake Erie & Western.—M. W. De Wolf has been appointed General Eastern Freight Agent of this company, with office at No. 401 Broadway, New York City, and will have immediate charge of all westbound traffic from New York City.

Norfolk, Albemarle & Atlantic.—William Evans, Jr., has been elected Vice-President of this company, with office at 96 Broadway, New York City. He also continues in the office of Treasurer. Joseph F. McLoughlin has been elected Secretary, with office in Mills Building, No. 35 Wall Street, New York.

Norfolk & Western.—At the annual meeting held in Roanoke, Va., May 3, the following directors were elected: Clarence H. Clark, Frederick J. Kimball, Charles Hacker, Joseph I. Doran, Richard S. Brock, Samuel A. Crozer, A. J. Dull, Upton L. Boyce, Walter H. Taylor, Robert Fleming, Howland Davis, William Vivian, Henry Whelen, Jr.

The following appointments were announced on May 3: Charles H. Mellon (formerly Assistant to the President), as Assistant Treasurer; E. T. Burnett (formerly Assistant Purchasing Agent), as Purchasing Agent, and S. G. Gaillard (formerly Assistant Engineer in charge of Construction), as Assistant to the President.

Pennsylvania.—Thomas S. Bell has been appointed Chief Clerk of the Car Record Office, with headquarters at Philadelphia, in place of Arthur Hale, who has been promoted to a higher position in the Transportation Department.

Philadelphia, Honesdale & Albany.—The companies formed under this name in New York and Pennsylvania have been consolidated and the following officers elected: President, H. Z. Russell; Vice-President, F. E. Ross; Secretary, Charles T. White; Treasurer, J. C. Tennis; Directors, S. N. Wheeler, W. W. Weston, H. Z. Russell, W. E. Holmes, H. M. Van Zandt, C. E. Hulbert, F. P. Beers, M. J. Corbett, J. L. Stuart, F. E. Ross, Thomas Kerry, W. Martin, J. C. Tennis George W. Kendrick, Jr., F. F. Whittekin and others. F. F. Whittekin, of Tionesta, Pa., is Chief Engineer.

Rome, Watertown & Ogdensburg.—Superintendent G. F. Huggins, of the Carthage & Adirondack, will be the new Trainmaster of the Eastern division of this road, which will include the old Utica & Black River, from Utica to Clayton and from Philadelphia to Ogdensburg, and the Carthage & Adirondack. His headquarters will be at Carthage, N. Y.

St. Louis, Chicago & St. Paul.—The following directors were elected at the annual meeting held in Alton, Ill: Henry O'Hara, C. E. Kimball, John Dickson, C. L. Whitney and B. F. Johnson.

St. Louis & Hannibal.—S. S. Palmer, formerly Secretary and Treasurer of this road, has been elected President, vice J. S. Blair, and M. T. Cox has been elected Secretary and Treasurer, both with office at 52 Wall street, New York City. The position of Vice-President and General Counsel, formerly occupied by J. H. Orr, has been abolished.

San Diego & Phœnix.—The directors of the company include D. C. Reed, State Harbor Commissioner and Director of the Bank of Commerce, San Diego; H. L. Titus, Director of the California Guaranty & Irrigation Company, San Diego; H. G. Merrill, San Diego; Gen. M. E. Collins Phœnix, Ariz., and others. D. C. Reed is President, and H. G. Merrill, Secretary.

San Francisco & North Pacific.—Sidney V. Smith has been elected General Counsel with headquarters in Mills Building, San Francisco, Cal., and John Bonner has been appointed Master Mechanic, with headquarters in Tiburon, Cal.

R. X. Ryan, late General Freight Agent of the Queen & Crescent, has been appointed General Freight and Passenger Agent of this road, with headquarters at San Francisco.

Savannah, Florida & Western.—The South Florida Railroad has been consolidated with the above company, under the name and charter of the latter. Capt. R. G. Fleming will continue Superintendent of the following lines, to be known as the Georgia Division, viz.: Savannah to Thomasville, Waycross to Jacksonville, Dupont to Gainesville, Lake City to Lake City Junction, Thomasville to Monticello, Thomasville to Albany. B. R. Swoope will continue Superintendent of the following lines, known as the South Florida Division: Sanford to Port Tampa, Bartow via Lakeland to Inverness, Bartow Junction to Bartow, Kissimmee to Narcoossee, Sanford to Lake Charm, and the line now under construction, from High Springs southward. Sanford, Fla., will be the headquarters of the South Florida Division.

Seaboard Air Line.—Cornelius Ironmonger has been appointed Eastern Passenger Agent of this road with office at No. 229 Broadway, New York City.

Southern Pacific Co. (Atlantic System).—J. D. Connell, having resigned to engage in other business, the jurisdiction of J. J. Ryan, General Master Mechanic of the lines west of Lafayette, has been extended to all lines in Louisiana east of that point.

Stuttgart & Arkansas River.—George E. Barstow has been elected President of this company, F. M. Gillett, of New York, formerly President, Vice-President, and Edward Hall General Manager.

Terre Haute & Indianapolis.—Charles R. Peddle has been appointed Purchasing Agent of this company, with office at Terre Haute, Ind., to fill the vacancy occasioned by the death of C. R. Peddle, Sr.

Texas Midland.—J. W. Culver having resigned as General Freight and Passenger Agent the office has been consolidated with the Auditor's office. W. E. L. Pierce has been appointed Acting General Freight and Passenger Agent in connection with his duties as Auditor. H. A. Couse has been appointed Resident Engineer and Division Superintendent.

Utah, Nevada & California.—At the annual meeting held in Salt Lake City, Utah, May 2, the following officers were elected: Francis Tiernan, President; R. L. Walker, Vice-President, Topeka, Kan.; J. J. Stewart, Secretary; E. J. Thorn, Treasurer, Salt Lake City.

West Shore.—C. A. Sheehan has been appointed General Advertising Agent of the General Passenger Department, with headquarters at No. 5 Vanderbilt avenue, New York.

RAILROAD CONSTRUCTION,

Incorporations, Surveys, Etc.

Altoona & Philipsburgh.—The contract has been recently let for building this road, and the contractors began the grading last week at Philipsburgh, Pa., where the road is to connect with the Beech Creek Line. The new road will be about 20 miles long, and extends through a coal region connecting with the Altoona, Clearfield & Northern, near Janesville. Samuel Langdon, of Philadelphia, is President, and W. J. Forsythe, of Altoona, is Chief Engineer.

Baltimore Belt.—Rapid progress is being made on the Belt Railroad, and the work is only delayed by the failure of the company to secure some rights of way on Section 3. The contractor's work on Section 1 is practically completed and part of the track has been laid. On Section 2 the masonry for the bridges at Garrett avenue and at Exter Hall avenue is completed and work on the bridge structures will soon be commenced. The work on the Jenkins Run arch has begun. The arch has a span of 10 ft. and is 150 ft. long. The contractors are now grading from Quaker lane to the east portal of the York road tunnel. The tunnel is being cleared to grade for the roadbed. The total amount of tunneling completed under Howard street, including the covered way south of Lombard street, is 6,984 ft. At the Preston street shaft 1,430 ft. are finished; at Madison street, 1,625 ft.; at Franklin street, 824 ft.; at Saratoga street, 953 ft.; at German street, 1,271 ft., and of the covered way 881 ft. In April, 124 ft. of tunnel were completed. There still remain 200 ft. to be finished at the Preston street shaft to bring the tunnel into the open cut at the Bolton lot, and 150 ft. of girder covered way south of Lombard street. A double tunnel, 266 ft. long, will be built under Mount Royal avenue. Each of these tunnels will contain two tracks. One of the tunnels is to be used for freight, and the other for passenger traffic. The double tunnel is to be constructed in order to give passenger trains standing room at the depot to be built on the Bolton lot. It will join the main tunnel on the north side of Mount Royal avenue, and on the south side of Bolton lot at Brevard street.

Baltimore & Cumberland.—The ceremony of "breaking ground" for the building of this line, which is the eastern extension of the West Virginia Central & Pittsburgh Railroad, was performed last Thursday by Mayor Hebb of Cumberland, Md. The work was commenced at the foot of Knobley Mountain, at a point where there is to be a cut 400 ft. long and over 50 ft. deep. Early this week a large force of men were put to work upon the line at different points, and the work is being pushed rapidly. The force will be increased to 500 men within the next two weeks.

Beech Creek.—The town of Lock Haven, Pa., desires to have a branch of this line built to that city, and engineers have made a survey. About $21,000 of the $25,000 necessary to build the branch has been subscribed.

Blackwater Valley.—A preliminary organization of this company, which was chartered this year, has been effected, and Hon C. C. Coffin, of Boston, elected President. The company has a charter for a line about 16 miles long to start from Mastyard station, near Concord N. H., and to extend northwest through the Blackwater River Valley, through the towns of Webster and Salisbury to Andover. The line will connect the Claremont and the Northern divisions of the Boston & Maine, giving it a shorter line from Concord to Andover and points north, and also avoiding the long heavy grades on the present line. The saving in distance will be 3½ miles.

Boyne City & Southeastern.—A company was incorporated in Michigan under this name this week, the principal office being at Boyne City.

Caldwell & Northern.—The contractors for the grading and tracklaying on the first 20 miles of this road are Dunavant, Corpening & Miller, who have a large force of men at work. Their headquarters will be at Lenoir, N. C. The road is to extend through Edgefield County from Lenoir to Caldwell. The Chief Engineer is Todd Montgomery. The contractors have a large force at work on the grading.

California & Nevada.—F. M. Smith, who has purchased this narrow gauge road, now completed from Wagner to Emeryville, in Alameda and Contra Costa counties, Cal., 18 miles, proposes to extend it to Walnut Creek, to make it a standard gauge road, and to put on a ferry line to San Francisco.

Canadian Pacific.—The weather has been unfavorable for the resumption of construction work on the "Soo" extension, north of the international boundary. There are a number of contracts to be let in connection with this line and there is some heavy bridge building, one structure south of Estevan, Man., being 1,200 ft. in length.

Cape Breton.—The Cape Breton Railway Extension Co. is vigorously pushing its survey from the Strait of Canso to Louisburg.

Charles City & Southern.—A construction company has just been organized to build the railroad from Charles City, Ia., to Root's Siding, 16 miles, on the Burlington, Cedar Rapids & Northern. A. H. Brackett is President; P. H. Powers, Vice-President; J. H. Lloyd Secretary, and J. H. Owen, Treasurer.

Charleston, Clendennin & Sutton.—This line, which is projected from Charleston to Sutton, W. Va., is completed as far as Big Sandy, on the Elk River, and the contractors have been paid for the work and the road accepted from them. The last installment of bonds, amounting to $5,000, was given by the County Court of Kenawha County to the contractors after some delay, caused by a difference of opinion as to whether the work had been done according to contract. The road will not be extended for the present, though the County Court of Clay County is making negotiations for the money to continue the line over the route originally laid out. The road to Big Sandy has been in operation for some time and is carrying considerable freight.

Chattanooga & Western.—A charter has been granted to this company in Tennessee, as recently reported. The incorporators are John Orr, D. T. Young, T. J. Nicholl and others, of Chattanooga. The line as proposed in the charter is from a point in the city of Chattanooga, across the Tennessee River and south to the Alabama state line; also from a point on Middle Creek, where it empties into the Tennessee River, northwesterly up that creek to Walden's Ridge. These are the principal lines. Other branches are proposed to develop the coal and iron mines, stone quarries and timber along the route.

Chicago, St. Paul, Minneapolis & Omaha.—Winston Bros., of Minneapolis, are reported to have the contract for the extension of the Ponca branch of this road to Newcastle, Neb. The line is about 15 miles long and is through a rough country.

Chippewa Falls & Northern.—S. F. Crabbe, of Chippewa Falls, Wis., Chief Engineer of this road, expects to commence the survey in about 30 days. The proposed route is from Cadott, a station on the Wisconsin Central, east of Chippewa Falls north to Little Falls, on the Chippewa River and thence north to Vernona, Wis., on the "Soo" Line.

Clearfield & Mahoning.—This branch of the Buffalo, Rochester & Pittsburgh has been completed from Clearfield to Du Bois, Pa. The line will be inspected this week by officials of the Buffalo, Rochester & Pittsburgh and Beech Creek roads. Passenger trains are expected to be running by June 1. This road has been built to connect with the Beech Creek road at Clearfield, and to reach the coalfields along that road. It is 26 miles long.

Denver & Rio Grande.—The engineering force has been increased preparatory to doing considerable new work during the coming summer in western Colorado

Duluth & Iron Range.—There are still three parties of engineers in the field making the permanent location of the new line from Two Harbors, Minn., to the Mesabi iron range. This road will be built during the summer, and the contract will be let as soon as the survey is completed. The distance will be about 63 miles. R. Angst, of Duluth, Minn., is Chief Engineer.

The extension of the Western Mesabi branch, seven miles, from McKinley to Virginia City, Minn., will be in operation about June 1. Messrs. Winston Brothers, of Minneapolis, Minn., are the contractors.

Duluth, Messabe & Northern.—There is a strife between three of the roads to determine for which one the proposition to issue bonds of the city of Duluth to the extent of $250,000 to build terminals at Duluth shall be voted on. It is probable that this line will be successful, as it was the first one to file its application for aid.

A branch 17 miles in length to the Lake Superior mine has been located, and the contract will be awarded soon. The work on the extension of the main line to the docks on St. Louis Bay is progressing satisfactorily. Wolf & King are the contractors.

Eaton & West Manchester.—F. M. Michael, F. M. Davisson, J. H. Foos, J. E. F. Horn, W. A. Hoffman, David Peters and F. Michael have incorporated this company in Indiana to connect the two towns mentioned in the title, located in Preble County. The capital is $25,000.

Florence, Cripple Creek & State Line.—Orman & Crooke, J. Carlisle and other leading contractors of Colorado recently went over the line of the proposed road from Florence, Col., to Cripple Creek, to examine the route selected. The local newspapers state that there is now no question that the line will be built.

Great Salt Lake & Hot Springs.—President Simon Bamberger, of Salt Lake City, reports that the party of engineers who have been surveying for the proposed line to Coalville in eastern Utah, 65 miles, since early spring have completed the preliminary survey and returned to Salt Lake City. Work on the extension north to Farmington, Utah, six miles, will probably begin this month.

Kansas City, Pittsburgh & Gulf.—The construction work on the extension from Hume, Mo., has been completed to Pittsburgh, Kan., as anticipated, but the new line will not be ready for regular train service until June 1. This extension is 50 miles long. Construction work is now going on between Pittsburgh and Joplin, Mo., about 25 miles, to connect the above road with the Kansas City, Forth Smith & Southern, which is owned in the same interest.

Kentucky Central.—The company has let to Thomas Woods, of Covington, Ky., a contract for building a branch line to connect with the Louisville & Nashville Railroad bridge across the Ohio River at Cincinnati. As soon as the contemplated changes are made to the bridge the trains of the Kentucky Central will enter Cincinnati over the tracks of the Louisville & Nashville through Newport to the Butler-street Station in Cincinnati, instead of running over the Chesapeake & Ohio Railroad bridge into the Grand Central Union Station

Lake Superior & Algoma Colonization.—The Railway Committee of the Ontario Legislature has passed an act incorporating the above company. The road is to extend from the mouth of the Batchewaung River to the North Channel, near the town of Thessalon.

Laurel Valley & Rousseau.—The charter of this company has been filed in Louisiana. The object is to build a road through Lafourche Parish, parallel to bayou Lafourche, to the Rousseau station of the Southern Pacific, about seven miles below Thibedaux, La. Wilson Lepine and Frank Barker are the directors and owners of the sugar-cane plantations through which the road will be built.

Mexico, Cuernavaca & Pacific.—The roadbed on this line has reached kilometre 30 from the City of Mexico. The rails are laid to near San Angel, at kilometre 20. It is expected that the road will reach Cuernavaca, Mex., by December. J. H. Hampson, the contractor, has 700 men employed.

Mobile & Ohio.—A special meeting of the stockholders has been called for May 29 at Mobile, Ala. They will be asked to authorize the proposed extension of the line to Montgomery, Ala. The plan for carrying out this extension has not been decided upon by the officers. The call for the meeting asks the stockholders to assent to a contract for the construction of the road by subscription to the capital stock of a separate company organized to build the road or by the guarantee of its bonds; or the purchase or lease of existing roads. The directors will probably acquire control of and complete the Montgomery, Tuskaloosa & Memphis road, which is already partly graded from Montgomery to Tuskaloosa, 105 miles, and has been surveyed to a connection with the Mobile & Ohio, near Columbus, Miss.

The business men of Houston, Miss., are reviving the project to build a branch of the road from Okolona, Miss., on the main line, a distance of 20 miles. President Clark had the road surveyed in 1890, but litigation prevented its construction.

Newfoundland.—William G. Reid, of Montreal, who is now building about 200 miles of road from St. Johns toward Hall's Bay, under a contract from the Newfoundland Government, is reported to have closed a contract with the government for building an additional 200 miles of road. The new line is to start from near Exploit, on the road now under construction, and traverses the interior of the island, touching the northeastern end, Grand and Deer lakes, following the course of the Humber River, tapping the Bay of Islands, Bay St. George, and running to Port Aux Basques on the southwestern extremity of the island, and the nearest point to Cape Breton. The contract price is $15,600 a mile, the line to be completed within four years.

Newport & Sherman's Valley.—Stock for the extension of this line to Dry Run, in Path Valley, is being taken rapidly and the extension is pretty well assured. The route will probably be across the mountain from New Germantown, Pa., where it starts, to Burns' Val-

ley, and thence by way of Doylesburg to Dry Run. A short tunnel will be necessary near New Germantown. The road is to be standard gauge, to conform to the change now being made on the present line.

New Roads.—Cunningham & Miller, the owners of a sugar plantation and refinery at Sugarland Station, Tex., have arranged to build 12 miles of railroad from near that point, connecting with the Southern Pacific, to Arcola, Tex., on the Gulf, Colorado & Santa Fé. The line has been located, and as the route is nearly all through land owned by the projectors there will be no delay in securing right of way.

Ottawa, Arnprior & Parry Sound.—E. F. Fauquier, of Toronto, has been awarded the contract for building this road from Arnprior west to Eganville, Ont. Speaking of the route, Mr. Fauquier says it will be equaled by none in Canada for that distance, there being but few curves and only easy grades on the whole 40 miles. There are but few bridges on it, and these are small. Until near Eganville the route is very level. Work will be commenced immediately, and Mr. Fauquier anticipates that the rails will be laid to Eganville by September next.

The Private Bills Committee of the Ontario Legislature passed a bill to authorize Ottawa, Ont., to issue debentures in aid of the road. This empowers Ottawa to give the company a bonus of $150,000.

Philadelphia, Honesdale & Albany.—The Tennis Construction Company has been organized with a capital of $500,000, and E. A. Tennis, of Thompsontown, has been elected President and L. H. Taylor, Jr., of Philadelphia, Treasurer. This construction company has been organized to build the road, for which preliminary surveys have been made during the spring, from White Haven and Honesdale, Pa., northeast to Hancock, N. Y., and toward Albany. The companies organized in Pennsylvania and New York have been recently consolidated under one charter. F. F. Whittekin, of Tionesta, Pa., is Chief Engineer.

Philadelphia & Pittsburgh.—A charter was granted at Harrisburg last week to this company. The road will be 44 miles long, through Clearfield, Cambria, Jefferson, Indiana and Armstrong counties, from Mahaffey, Clearfield County, to a point near Kittanning, in Armstrong County. The President is William C. Wagonknight, of Philadelphia, and the Directors are S. H. Hicks, C. F. Lukens, Theodore P. Farrell, E. S. Purnance and Charles E Perkins, all of Philadelphia, and R. C. Bellville, of Trenton.

Quaker City Elevated.—The Rapid Transit bill, to enable the Northeastern and Quaker City Elevated Railroad companies to build their roads in Philadelphia, was defeated in the House of Representatives this week on final passage. The vote was immediately reconsidered, and the consideration of the bill postponed for the present. There is little chance that the bill will be reached again. The bill defeated was the so-called Crothers' bill, introduced at the request of a committee of Philadelphia citizens. Early in the session a bill was introduced by Representative Tow, ostensibly to regulate the construction of elevated roads in cities. But the friends of the Phildelaphia elevated projects believed that it would have the effect of preventing the construction of any elevated railroads, and called a general meeting of citizens, at which the Crothers bill was prepared. The terms of this bill were satisfactory to the elevated railroad managers. The 300 men who were working on the elevated structure on Front street (the Northeastern line) have been discharged. Work had been going on on this line, because the Court of Common Pleas had decided that the company had power to build an elevated line under existing railroad laws. Another court, however, had enjoined the company from proceeding with the construction on the Quaker City line, on Market street, on the ground that it had no such power. The litigation will be carried to the Supreme Court, but the suits cannot come before that court before January next. Now that the bill, which gave explicit authority to build elevated lines, has failed of passage, little actual progress can be made until a judgment is handed down by the Supreme Court.

Raleigh & Augusta Air Line.—The Carthage road, a branch of the Seaboard Air Line, has been extended from Carthage as far as Cumesville, in Moore County, N. C., and the first passengers and freight were transported to that place this week.

San Diego & Phœnix.—The preliminary surveys for this road have just been started from both San Diego and Yuma, Cal. Considerable right of way has already been secured near San Diego, and the right of way through Arizona is also promised. A prospectus issued by the projectors gives some details of the company. Two charters have been secured, one in California and the other in Arizona, both under the same name. Four hundred thousand dollars of the capital stock of the California Company is reported subscribed, and $350,000 of the stock of the Arizona Company. The California line will extend from San Diego through the New River Valley and the Jacumba and Jamul valleys of California to Yuma, 175 miles, and the Arizona section from Yuma through the Salt River, Mohawk and Gila valleys to Phœnix, 125 miles. D. C. Reed, of San Diego, is President, and H. G. Merrill Secretary, of both companies.

Spokane Falls & Northern.—The contractors on the extension from Northport, Wash., to the boundary line will commence to lay track on the extension in about one week. Work will be pushed through as fast as possible, and it is thought that the road will be completed in 10 days after work begins. The bridge men have been detained on account of having to wait for bridge material. P. Larson, the contractor for the Nelson & Fort Sheppard road, will soon have 2,000 men at work.

Tuscarora Valley.—It is currently reported that the road is to be extended to Concord, Pa., this year, and that grading will be commenced at an early date.

Union Pacific.—Investigations of the anthracite fields of western Colorado are being made by the company, and further extensions will be made if the reports are satisfactory. The Alpine Pass Line may be opened this summer.

White & Columbia River.—Articles of incorporation were filed in Washington State last week by this company. The capital stock is $50,000. The purpose of the company is to build a railroad from Buckley easterly, following the White and Greenwater rivers, to a point on the Columbia River. The directors are: Charles W. Joynt, David S. Morris, Samuel H. Hart, Edward Collins, Eugene Van Alstine, William McNeal and John McKenel.

Wilmington, New Berne & Norfolk.—The Wilmington, Onslow & East Carolina road has been reorganized under the above name, and the new company will formally assume control on June 12. The company is now operating 65 miles of road between Wilmington and Maysville, N. C., and an extension of 25 miles from Wilmington to New Berne will be completed and ready for operation by June.

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—The comparative statement of operations for the month of March and the nine months of the fiscal year is shown in the following tables:

Month of March:	1893.	1892.	Inc.
Aver. operated mileage..	7,130	7,128	2
Gross railroad earn.....	$3,171,343	$2,708,248	$463,095
Oper. expen.....	2,363,811	1,968,321	395,490
Net earn.....	$807,532	$739,927	$67,605
Other receipts.....	75,000	75,000	.....
Total net earn.....	$882,532	$814,927	$67,605
Fixed charges.....	850,000	850,000	.....
Surplus.....	$32,532	$35,073	$67,605
Nine months to March 31:			
Aver. operated mileage..	7,130	7,123	7
Gross railroad earn.....	$29,604,318	$27,440,688	$2,163,630
Oper. expenses.....	20,469,075	19,124,377	1,344,698
Net earnings.....	$9,135,243	$8,316,311	$818,932
Other receipts.....	675,000	675,000	.....
Total net earn..... ...	$9,810,243	$8,991,311	$818,932
Fixed charges (est.).....	7,650,000	7,650,000	.....
Surplus	$2,160,243	$1,341,311	$818,932

The report for the same p eriod, including the earnings of the St. Louis & San Fr ancisco and the Colorado Midland, is as follows:

AGGREGATED GENERAL SYSTEM.

Month of March:	1893.	1892.	Inc. or dec.
Aver. operated mileage..	9,344	9,342	I. 2
Gross railroad earn.	$4.170,589	$3,554,086	I. $576,453
Oper. expenses.....	3,059,946	2,555,544	I 504,402
Net earn.....	$1,070,593	$998,512	I. $72,051
Deficit.....	$48,407	$118,458	D. $70,051
Nine months to March 31:			
Gross railroad earn	$38,415,747	$35,742,924	I. $2,672,823
Oper. expenses	26,413,577	24,463,595	I. 1,949,982
Net earn.....	$12,002,170	$11,279,329	I. $722,841
Surplus.....	$1,931,170	$1,226,329	I. $704,841

Canadian Pacific.—The annual report shows gross earnings for the year to be $21,409,351, working expenses $12,989,004, leaving net earnings of $8,420,347. After deducting interest, fixed charges and dividends, the surplus is $2,221,932, which, with a surplus for the previous year of $4,701,599, makes a total surplus carried forward of $6,923,531. The most important feature of the annual meeting this week was the adoption of a resolution by the shareholders authorizing the directors to issue preferred stock in addition to the capital stock now outstanding. The directors were authorized to issue preferred stock to the amount of $8,000,000, bearing interest at 4 per cent.

Cleveland, Cincinnati, Chicago & St. Louis.—The stockholders have authorized the proposed issue of $50,000,000 of four per cent. bonds and the extension of the road to Jeffersonville and New Albany, Ind., and Louisville, Ky., by building new lines or by the lease or purchase of existing lines. Five millions of the bonds are to be used for double-tracking and equipment; $29,000,000 to be reserved to retire outstanding bonds now secured by mortgage on portions of the property, and the other $16,000,000 to be used only after 1894 at the rate of $1,000,000 a year for double track, equipment and construction purposes.

Concord & Montreal.—The directors of this company—a majority of whom have hitherto been understood to oppose any scheme which would surrender the independent status of the road—have appointed a committee to confer with the Boston & Maine to see what arrangements can be agreed upon between them for a lease of the Concord Railroad.

Mexican Central.—The annual report of the Company for 1892, issued this week, shows a deficit for the year over all charges and interest upon the first income bonds, of $139,084, including $500,000 received from the subsidy trust fund. Excluding receipts from the subsidy trust fund and the interest upon the first incomes, the company shows a deficit of $169,739 over the absolute fixed charges. President Reynolds says in his report: "Had we received the same price for Mexican silver in 1892 as in 1891, instead of a deficit in earning we should have had a surplus of $205,551, or an increase of $117,565 over 1891."

New York, Susquehanna & Western.—The railroad has issued a mortgage for $2,000,000 to the United States Trust Co., covering its terminal commonly known as the Palisade Tunnel, which was recently acquired by the absorption of the Hudson River Railroad & Terminal Co. The bonds, which are known as first mortgage terminal bonds, are for 50 years at five per cent.

Pennsylvania.—The company has concluded a negotiation with Speyer & Co., of New York, for $6,000,000 of its consolidated mortgage gold bonds, running 50 years, at four per cent. interest. No bonds have been issued under this mortgage since 1879.

Port Royal & Western Carolina.—The meeting of stockholders of the railroad, now under control of the Central of Georgia, resulted in the election of two sets of officers. The Committee on Credentials reported against recognizing the majority stock held by Receiver Comer, of the Central of Georgia, who was present to vote it. The meeting then divided and each party elected officers. The minority meeting demanded an accounting of the road's affairs from the Central. A suit for a separate receiver is now being heard before Judge Simonton in the United States Court at Charleston, S. C

Seattle, Lake Shore & Eastern.—The suit of Thomas Earle and other stockholders for the appointment of a Receiver has been set for hearing before Judge Hanford of the United States Court on May 20.

Texas, Santa Fe & Northern.—On application of the Farmers' Loan & Trust Co., of New York, and the bondholders, Associate Justice Teeds, of the Territorial Supreme Court, in Santa Fé, New Mexico, has appointed E. R. Chapman, of the firm of Moore & Schley, New York, receiver of the road, extending from Santa Fé to Española, N. Nex., a distance of 40 miles. The mortgage held by the trust company amounts to $575,000.

TRAFFIC.

Traffic Notes.

A dispatch from Raleigh, N. C., states that the Richmond & Danville now runs three fast trains every day to carry the northbound vegetable and fruit traffic.

The vessels sailing from Buffalo to Duluth have taken coal this week at 30 cents a ton. Vessels to points on Lake Michigan have reduced the rate from 60 cents to 50.

At Hot Springs, Ark., on Wednesday of last week there was a meeting of passenger representatives of various roads in that part of the country. They call their organization the Southwestern Passenger Association.

The ice is so thick at Duluth that the probable date of opening navigation is still very uncertain. The elevators there are practically full, having about 17,000,000 bushels of wheat. At Montreal there is complaint among the grain men because the canals around the rapids of the St. Lawrence are not ready for use.

The Richmond & Danville has put on a new fast mail train between Washington and Atlanta. The Seaboard Air Line announces a through daily passenger train between Washington and Atlanta via the Atlantic coast line and Weldon, N. C. The time through is about 22 hours southbound and 21 hours northbound.

San Francisco papers report that travel to Chicago from California is already heavy, the regular trains having double the usual number of sleeping cars. The excursion fare is $100 for the round trip.

The New York Central and the Michigan Central ran one of their most elegant trains of Wagner sleeping cars from New York to Chicago last week to carry to the World's Fair a company of naval officers from the various foreign fleets now lying at New York. The Pennsylvania ran an equally handsome train of Pullman cars to bring the officers back this week. The latter train, consisting of eight heavy sleeping cars, ran from West Philadelphia (Fifty-second street) to Jersey City, 92 miles, in 100 minutes.

Chicago Traffic Matters.

CHICAGO, May 11, 1893.

Passenger rates west of Chicago are still in an unsettled state, owing to the continuance of the fight in Colorado. The Colorado lines are quoting a round trip rate of $30 to Chicago, a reduction of $15 from the agreed rate. In Colorado rates have reached an absurdly low figure, as low as 25 cents having been quoted between Denver and Leadville, Aspen and Glenwood Springs. Efforts are being made to get the Directors of the Rio Grande and Santa Fe together and stop the demoralization.

Commissioners Walker, Goddard and Blanchard have issued a supplementary commission notice, addressed to "all connecting lines and ticket agents and ticket sellers," calling attention to the agreements of Feb. 24 and March 17 and 18, not to reduce properly authorized passenger fares by any form of concession whatsoever, or pay, share or allow east of Chicago, St. Louis, Louisville and Cincinnati, the whole or any part of any form of commission or other allowances for or in connection with the sale of east-bound tickets, wherever issued, etc.; and giving notice that no commission payments or other allowances will be made contrary to this agreement after March 31. It is further announced that at a meeting held in Chicago on April 5 it was further agreed to discontinue the payment of all commissions to, from and through the territory of the Central Traffic Association. This agreement covers both east-bound and west-bound traffic. No commission payments or other allowances will be made contrary to the latter agreement after April 30.

The Western Passenger Association has agreed to place on sale around-the-world tourist tickets, via Chicago, for $600.

The Lake Erie & Western still continues a disturbing element in the Chicago & Ohio River Association situation, having declined to join in any agreement with that association for the maintenance of rates.

Western Passenger Association roads will hereafter carry bicycles and baby carriages in baggage cars at the rate for 100 lbs. of baggage.

Complaints have been frequent for the last two or three weeks that the scalpers were loaded up with tickets over the New York, Chicago & St. Louis, which they were selling at a reduction of from $1 to $2 below the agreed rates. The competitors of the Nickel Plate threatened to meet the cuts openly unless they were stopped. The threats evidently had the desired effect as the market appears to be now clear of these tickets.

The shipments of eastbound freight, not including live stock, from Chicago, by all the lines, for the week ending May 6, amounted to 52,536 tons, against 60,331 tons during the preceding week, a decrease of 7,797 tons, and against 55,968 tons during the corresponding week of 1892. The proportions carried by each road were:

Roads.	W'k to May 6.		W'k to Apl. 29.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	6,745	12.8	8,228	13.6
Wabash.....	3,756	7.2	3,925	6.5
Lake Shore & Michigan South.	10,209	19.4	13,457	22.3
Pitts., Ft. Wayne & Chicago..	7,427	14.1	6,959	11.5
Pitts., Cin., Chicago & St. Louis	6,265	11.9	7,235	12.0
Baltimore & Ohio.....	3,283	6.3	3,394	5.7
Chicago & Grand Trunk.....	3,335	6.4	4,848	8.0
New York, Chic. & St. Louis...	4,913	9.4	4,370	7.3
Chicago & Erie.....	4,635	8.8	5,399	9.0
C., C., C. & St. Louis.....	1,950	3.7	2,516	4.1
Totals.....	52,536	100.0	60,331	100.0

Of the above shipments 2,892 tons were flour, 20,276 tons grain and millstuff, 7,263 tons cured meats, 12,631 tons dressed beef, 1,301 tons hides and 5,829 tons lumber. The three Vanderbilt lines carried 41.6 per cent., the two Pennsylvania lines 26 per cent. The Lake lines carried 82,215 tons, against 84,176 tons during the preceding week, a decrease of 1,961 tons.